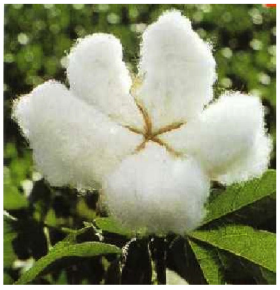
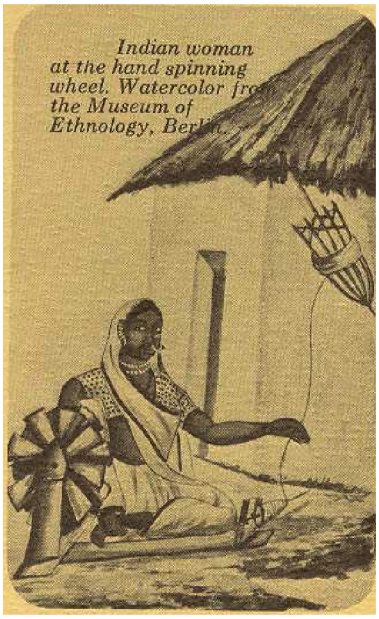
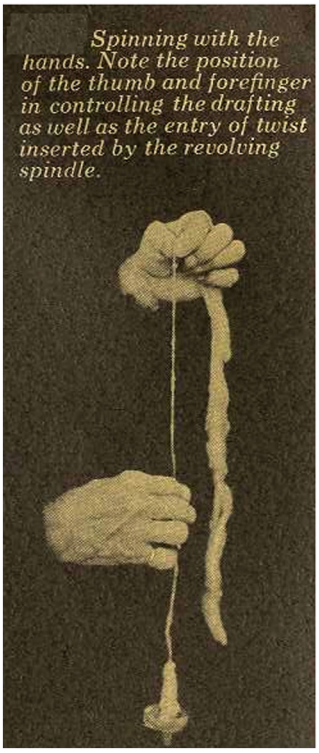


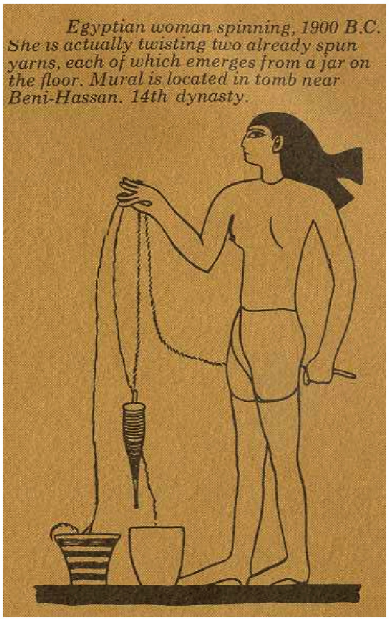
MY SPIN LAB



Indian woman at the hand spinning wheel. Watercolor from the Museum of Ethnology, Berlin.

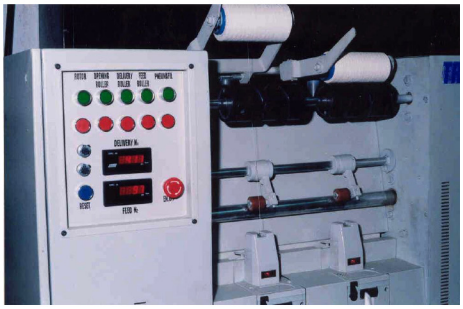


Spinning with the hands. Note the position of the thumb and forefinger in controlling the drafting as well as the entry of twist inserted by the revolving spindle.



Egyptian woman spinning, 1900 B.C. She is actually twisting two already spun yarns, each of which emerges from a jar on the floor. Mural is located in tomb near Beni-Hassan. 14th dynasty.

HOLALKERE RANGARAO LAXMIVENKATESH



MECHANICAL PROCESSING DIVISION

My Spin Lab

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E-mail: hrl_ven_44@rediffmail.com

Front Cover:
Second Row (Left to right)
1. Indian woman at the hand spinning wheel, water color, Museum of Ethnology, Berlin.
2. Spinning with the hand.
3. Egyptian woman spinning, 1900 B.C., Mural in tomb near Beni-Hassan, 14th dynasty.

Design of the front cover: Amar K. Chaphekar

Back Cover:
Top: Technological Laboratory (1924)
Bottom: Central Institute for Research on Cotton Technology, Adenwala Rd, Matunga, Mumbai- 400 019 (2005)

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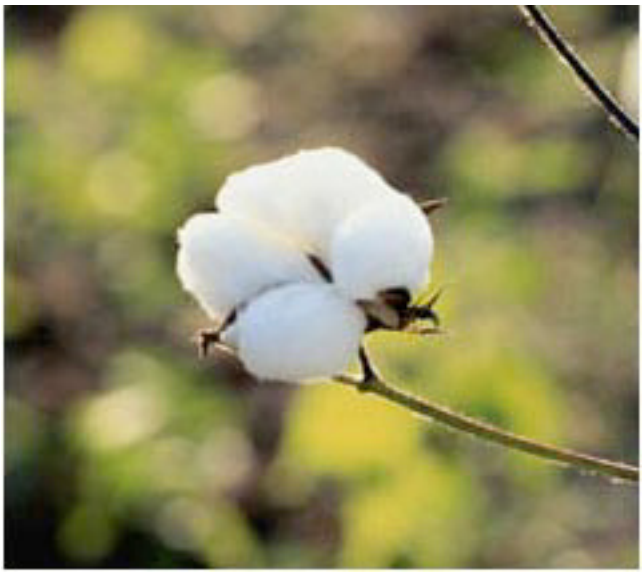
Columbia, MO 65203, USA
Editor: Indu Chandrasekhar

THIS
BOOK
IS DEDICATED
TO THE
OPERATIVES
OF THE
MECHANICAL PROCESSING DIVISION



HOLALKERE RANGARAO
LAXMIVENKATESH

CONTENTS

PLATES

Indian Council of Agricultural Research

Sardar Patel Outstanding ICAR Institution Award 2004

The Sardar Patel Outstanding ICAR Institution Award for the year 2004 is presented to

Central Institute for Research on Cotton Technology (CIRCOT), Mumbai

for outstanding contribution in the field of

Cotton Technology

New Delhi
16 July 2005

Mangala Rai
Director-General

Sharad Pawar
Union Minister for Agriculture

Dr. S. Srinivasan, Director, CIRCOT, Mumbai, receiving the Sardar Patel Outstanding ICAR award from Sri. Sharad Pawar, Union Minister for Agriculture, Food and Civil Supplies, Consumer Affairs and Public Distribution on 16th July 2005.

FOREWORD

DR. N. Balasubramanian
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CHARTERED TEXTILE TECHNOLOGIST
Tel. : ~~556777~~ 25280767

Block 1, First Floor,
Rajeswari, 36, 17th Road,
Chembur, Mumbai-400 071.

Dt. : 12 - 6 - 2005

One associates the term "classical" with the Research and Development work carried out by CIRCOT, originally known as the Cotton Technological Laboratory. This used to be considered at one time as the *Shirley Institute* of India because of the basic work done. I am glad to find in 'My Spin Lab' a meticulously prepared history of the progress of the laboratory, particularly its Mechanical Processing Division. Some rare photographs of eminent persons who visited the laboratory over the years are found here, apart from photographs of all the Directors. This book will provide useful insight to any one interested to know in depth the progress of the institute over the years and the changes it has undergone in its infrastructure. As a past employee of the institute, it gave me great pleasure to go through the various phases of development of this institute and recall memories of my stint with the laboratory.

Mr. Laxmivenkatesh, who has spent over 37 years at the institute, has done an excellent job in bringing out this publication. This book will be a good guide to those interested in knowing about this institute and others who are starting their careers in textile research.

N. Balasubramanian
12 - 6 - 2005

Dr. N. Balasubramanian
B.Sc. (Tech), M.Sc., Ph.D., F.T.I., Hon. F.T.I. (Textile Institute)

Mahatma Gandhi at the Spinning Wheel
Photo: Margaret Bourke-White

"Swaraj (self-rule) without Swadeshi (country made goods) is a lifeless corpse and if Swadeshi is the soul of Swaraj, Khadi is the essence of Swedeshi."

Mahatma Gandhi

"The history of cotton and of textiles is not only the history of the growth of modern industry in India, but in essence, it might be considered the history of India during the past one hundred years."

Pandit Jawaharlal Nehru

Preface

Cotton has always been my favorite subject. In my childhood days, I used to watch weavers for hours as they worked with handlooms in my village. My mother made cotton garlands during Ganesh festival. She also knew the technique of hand spinning; these garlands were exclusively prepared by the cottons grown in the backyard of my house. This childhood experience triggered in me the desire to pursue a career in textile technology. During my first job in a textile mill, I gained invaluable insights into the various facets of fabric manufacture.

My quest to know more about cottons, such as Sea Island, American and Egyptian, was fulfilled when I joined the Cotton Technological Research Laboratory (CTRL), as a research assistant in 1967. The atmosphere, then, was quite similar to mills. The excellent work culture, which prevailed in the lab, and the spinning division in particular, impressed me very much. My seniors were very knowledgeable and helpful. We had an excellent library. I also read a lot about cotton trade and cotton quality improvement programs through breeding, testing instruments, and their developments. In addition, my knowledge of the application of modern scientific methods in the cotton manufacturing technology was constantly updated.

Research in cotton technology in India started as early as 1927 by the first director of the laboratory, Sri. A. J. Turner. The initial studies done at the lab were on the structure of the cotton fibre, variations in the properties of the cotton fibre in relation to its position on the surface of the seed, the strength of attachment of fibres to the seed, pre-cleaning studies of ginning, conversions of single roller gins with ball bearings, the patented Ginning percentage balance, survey of gins in India, inter-relationship between spinning and the fibre properties, and so on. The most heartening aspect was that the operatives, assistants and the spinning masters put their heart and soul into the projects undertaken in those days. The Technological Laboratory was the only organization in all of Asia where some of the most fundamental and useful research was undertaken under the able guidance of Sri. A.J. Turner.

I want to emphasize here that spinning became one of the major deciding factors determining cotton quality. Most of the projects invariably demanded spinning tests. Hence spinning of thousands of samples in connection with various research projects became a real challenge, since the machines were slow and laborious to operate. Some of the machines demanded high skill. It is thus highly

relevant to mention here the sincere efforts of the dedicated staff members and operatives, which may be termed as unique and vibrant- a tribute to their enduring spirit of resilience and optimism that has constantly surfaced throughout the history of the laboratory.

I have always longed to bring some of the above-mentioned aspects into book form. In fact, these extracts were chosen from various periodicals, journals and annual reports. I don't dare to claim them as my own. I shall be immensely happy if the manuscript conveys their true meaning without drifting from reality. This task was made possible with the support of many of my colleagues. I am indeed thankful to them. I thank Sri A.K.Chaphekar, who designed the coverpage and prepared the book for release in a short time. My sincere thanks go to Sri. Muntazir Ahmed, Head of the Division, and Dr. S.K. Chattopadhyay, in charge of the section, for their encouragement. Finally, I am grateful to our Director for allowing me to publish this book for the internal circulation in our division and the library as well. My senior friends Thama Bhiwaji Dangle, M.M Rupawate, Popat Jairam Ahire, P.G. Oak, Panwalkar, K.S Bhyrappa, A.V. Ukidwe, H.V. Thamankar, K.S. Shamarao, B.M. Petkar and others provided useful information. I have collected several rare photos and personal data from the following journals:

Empire Cotton Growing Review	Indian Textile Journal
Indian Society for Cotton Improvement	Shirley Institute Memoirs
Textile Mercury and Argus	Textile Institute and Industry
Journal of the Textile Institute	Indian Cotton Growing Review
50 Years of Research- Dr. V. Sundaram	Textile Weekly

It was very difficult to get the photos of several eminent cotton scientists like Dr. Balls, Sir Joseph B. Huchinson, Zaitzev, and others. But it was equally difficult to get the photo of Dr. C.T. Patel, whom we regard as the father of hybrid cottons in India. I am greatly indebted to my friend Dr.Y. Subramaniam of Surat, who took special initiative to acquire the photo of Dr. C.T. Patel from his family members staying at Anand, Gujarat. Sri. Radha Krishna Murthy was very helpful in scanning the photographs, some of which were as much as 80 years old. I am grateful to Smt. R.K. Shahani and Smt. Prachi Mhatre for providing the required information and also lending rare books and periodicals. My sons Chi. Ravindra and Chi. Prakash helped me in typing and consolidating this huge volume of data. I am also grateful to T.K.M. Das, Technical officer, who gave valuable information and also shared the rare copy of Sir. C.V. Raman's visit to our spinning laboratory during Dr. Nanjundaiah's time. I am also grateful to my friend Sri. R.M. Mody, who took the photos of the Spinning section. He is an accomplished photographer. Finally, I would like to thank my beloved wife Saroja for her indefatigable support and spirit.

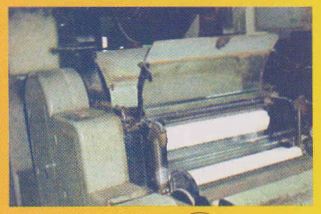
H. R. Laxmivenkatesh **January 31, 2004**

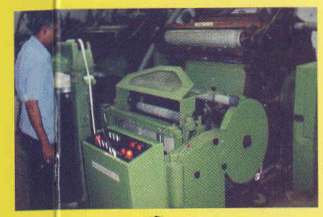
With current staff of Mechanical Processing Division (2004)

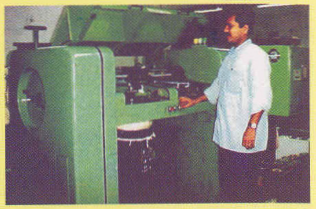
Sitting : L to R , Sri M.R. Nevrekar, Sri B.R. Jadhav, Sri M.B. Thokrul, Sri G.G. Ambare, Sri S. Surukule, Sri M.Y. Chandanshive, Sri S.M. Sawant, Sri G.S. Deorurkhar, Sri T.S, Mhaske, Sri S.K. Parab, Sri M.B. Chandanshive, Sri B.R. Satam, Sri S.G. Waghela,

Standing : H.R.LaxmiVenkatesh, Sri D.U. Kamble, Smt. Bindu Venugopal, Sri A.K. Chaphekar, Sri A.P. Modak

Full Spinning Process







Hand Opening

Minimum 5 Kg Cotton

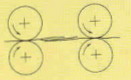
Blow Room Process

Lap

Carding

Sliver 0.12 to 0.22 Ne

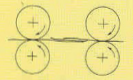
34 m/min



1st Drawing

Sliver 0.12 to 0.25 Ne

200 m/min



2nd Drawing

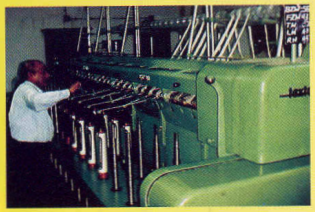
0.12 to 0.25 Ne

200 m/min

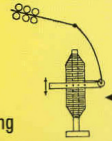
Speed Frame

0.75 to 3.5 Ne

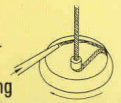
10 to 30 m/min



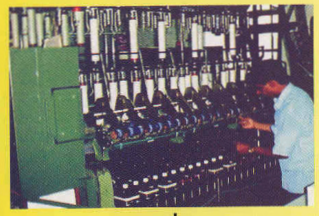
Roving



Ring Spinning

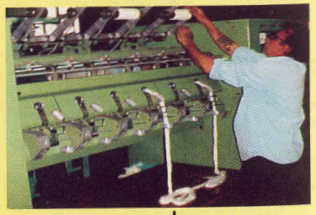


Rotor Spinning



Yarn 16s to 150s Ne

7 to 15 m/min



Yarn 2s to 30s Ne

40 to 130 m/min

(iii) Lakshmi-Rieter DO/2 high speed drawframe

(iv) Lakshmi-Rieter type GS and Textool type TS 15 speed frame

(v) Lakshmi-Rieter type DJ5 and Textool type DJ50 high speed ring frame

(vi) Rieter MO/5 rotor frame

(vii) Computerised lea tester

User Specified Tests

An user can specify the following additions/alterations for a full spinning test

(i) End break rate at ring and rotor frames

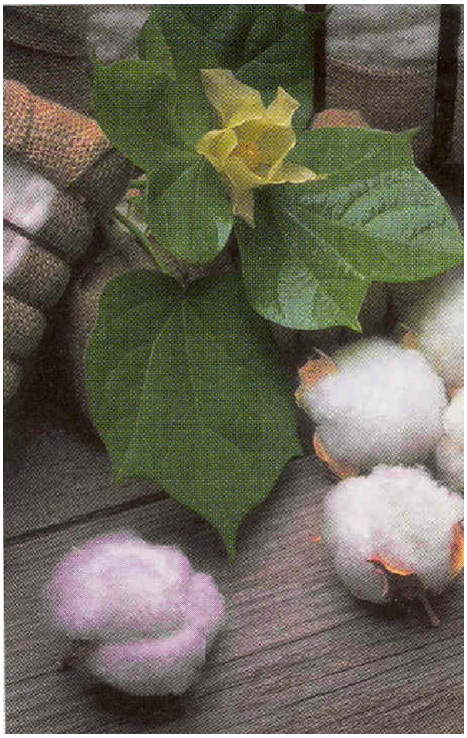
(ii) Determination of yarn appearance and hairiness

(iii) Production of combed yarn (subject to supply of 50 kg of cotton lint or sliver)

(iv) Determination of trash content in raw cotton

CIRCOT Full Spinning System

The Cotton Plant



What a royal plant it is!
The world waits in attendance on its growth.
The shower that falls whispering on its
leaves are heard around the earth.
The Sun that shines on it is tempered
by the prayers of all people.
The frost that chills it and the dew
that rescends from the stars is noted,
and the trespass of a little worm on its green
Leaf, is more to England than the advance of the
Russian army on her Asian outposts.
It is gold from the instant It
puts forth its tiny shoot.
Its fibre is current in every bank,
and when loosing its fleece to the Sun,
it floats a banner that glorifies
the field of the humble farmer;
that man is marshalled
Under a flag that will compel the
allegiance of the world,
and wring tribute from every nation on earth,
It is the heritage that God gave to
This people for ever as their own when
he arched our skies,
established our mountains,
girt us about with the ocean,
loosed the breezes,
tempered the sunshine and measured the rain.
Ours and our children's forever!
As princely a talent as ever came from
His hand to mortal stewardship.

Source: "Cotton," January 1929 p. 271
Henry W. Grady.

His Highness Governor Lord LinLithgo (P.C, GEIE; GMSI; GMIE; DL;TD) visiting the Technological Laboratory in Feb. 1939

Spinning Laboratory.

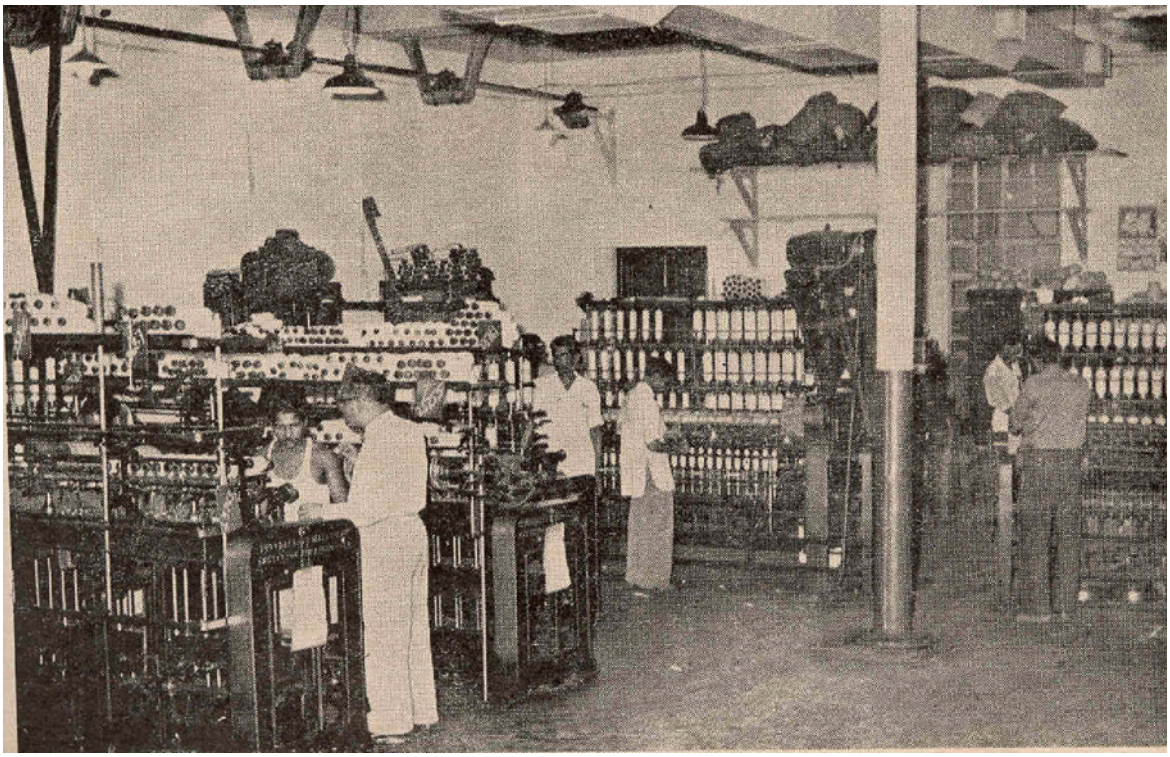
My Spin Lab

The present Central Institute for Research on Cotton Technology (CIRCOT), earlier known as The Cotton Technological Research Laboratory (CTRL), of the erstwhile Technological Laboratory (TL), has a long history of more than seven and half decades of immense service to Indian agriculture, with the goal of helping to enhance the quality of Indian cotton, and increasing its productivity. I am extremely happy to have been able to associate myself in this endeavor for a period of 36 years, starting from 1967, when I joined this institution. Since then it has become a quest to involve myself in identifying the prominent strains that enhance spinning potential and all the relevant quality requirements needed for the textile industry. I have studied the history of the long and eventful growth of the Technological Laboratory for 50 years, starting with its advent in 1924, and also during the later period up to the date of my laying down office (on 31st January 2004). Perhaps the days prior to 1924 were even more exciting, since there was not a single Institute in the country or in Asia, where cotton fibre was studied so extensively!

Cotton is the only textile fibre researched world over on an astronomical scale. It is so versatile and unique, has a quality that surpasses all the other fibres in its comfort, has a long life, and has multifaceted uses. The following paragraphs unfold the secrets of this "God's gift to nature," which broke all the geographical barriers and stood the test of time.

Although organized textile industry started first in Britain, it had its share of evolution and revolution in other parts of the world. The Industrial Revolution, which took place in Britain in 1767, focused mainly on the invention of machines which produced cotton yarn on a large scale, leading to the production of cotton textile fabrics, hitherto largely a home industry. The new machines played a major role in transforming natural boundaries of countries and even continents. In India, textile mills were established first at Calcutta in 1818, and later at Bombay in 1854. Mills were started at Pondicherry, Madhurai and Ahmedabad in a big way. The machines brought great prosperity and better living conditions in the urban areas. As a whole, India also became a prominent textile producer, although 80% of the required machinery came from Britain. This led to the growth of Railway and steam navigation systems and proliferation of several ancillary industries. In the words of Pandit Jawaharlal Nehru, "The history of cotton and of textiles is not only the history of the growth of modern industry in India, but in essence, it might be considered the history of India during the past one hundred years."

At the time when 'Technological Laboratory' (now CIRCOT), took birth in 1924, at Adenwala road, Matunga, Bombay. Cotton textile industries were already flourishing in Bombay. Our entrepreneurs, mainly Parsis and Marwadis, had rich experience in managing the mills for over 50 years. Industry was availing the Indian cottons for courser counts, since there were absolutely no long staple varieties, which were needed for manufacturing the finer fabrics. Lancashire engineers were employed



Technological Laboratory Spinning Section during 1966-67

CIRCOT - 2004

in some of the Bombay mills and most of other up-country mills, for training local technicians, where the cotton industry was at its zenith during the beginning of the twentieth century.

After the American civil war, the supply of American cotton was very inconsistent and the mills at Manchester suffered the most. Since they were starving for cotton, hundreds of mills were closed. This situation remained the same for several years and was further aggravated when America started her own mills and stopped supplying her cottons to England. The British government formed the Imperial Cotton Association in 1904; Lancashire had to search for new colonies where they could get the alternative supply of raw material. Egypt, the West Indies and African colonies were chosen as new locations for producing long staple cottons to suit the requirement of their industry. India, despite being the cradle of cotton and cotton textiles for times immemorial, produced cottons that were not suited for Manchester mills, since they were short and rough. British set up McKenna's committee to see the possibilities in identifying areas to grow long staple American cottons. The Indian Central Cotton Committee (ICCC), established in 1923, made several recommendations, and provided the whole Indian continent with American cotton seeds, and carried out organized cotton breeding research work starting from Punjab to south India and Gujarat to Bengal. All the cotton samples were brought to the Technological Laboratory at Bombay, which conducted where fibre tests and spinning tests. Apart from this, various studies like the morphology and internal structure of the cotton fibres and fibre characteristics in relation to its spinning value were among the major findings during the beginning of the laboratory. This contributed in a big way to the production of quality cottons in India.

Thus, the newly started "Technological laboratory" was the brainchild of the British. They were so enthusiastic in their new project that they completed the spinning building in 1924, in a year's time. The spinning machines manufactured in England in 1924 were trans-shipped to Bombay and installed that same year at the laboratory. By the end of the year, spinning tests were also conducted. It is important to note that, India, during the years when the laboratory came into existence, was reeling under a severe nationalistic movement. Mahatma Gandhi's 'Swadeshi Andolan' was attracting a huge number of people, including women and students, young and old. British-made mill clothes were burnt and hand spun khadi goods were encouraged. Of course, Gandhi was in no way against the fabrics made by Indian Mills or research and developmental work of Indian cottons. His main emphasis was on self-reliance, and in banning the use of imported cotton fabrics.

The Indian Central Cotton Committee, thus formed, took the lead in identifying the prominent local varieties and improving their quality characteristics and also propagating long staple American varieties. Incidentally, the Committee financed nearly 300 research schemes during the period from 1923 -1966, in various cotton growing tracts of the country, dealing with breeding and selection of new strains, agronomic trials to improve yield, studies on physiological aspects of the cotton plant, pathological and entomological studies to control diseases and pests, etc. After India gained independence, large areas of irrigated cotton belts were lost to Pakistan. This resulted in shortage of cotton

fibre for the domestic consumption and required several measures to be taken to make up this gap.

During late 60s, the Scientists felt the need for reorganizing the cotton research activities in the country. Accordingly, Agricultural Research Review Team recommended that there was a greater need for the co-coordinated approach where cotton breeders, entomologists, and pathologists come together on a common platform, so that they could tackle the problems in a more effective way. Hence, the commodity committees of the ICCC were abolished and agricultural research was done under the supervision of the Indian Council for Agricultural Research (ICAR). With the result, the administrative control of the Technological Laboratory was passed on to ICAR on 1st April 1966. Obviously, the name of the Laboratory was changed to Cotton Technological Research Laboratory (CTRL). The Director of CTRL was nominated as the principle investigator, to coordinate the technological aspects under the All India Coordinated Cotton Improvement Project (AICCIP), initiated by ICAR in 1967. This development led to a greater coordination between CTRL and breeders, and considerably the tempo of research work at CTRL since technological research work was very much needed to promote the cotton in the Textile mills where quality and productivity are the only yardsticks needed by the cotton merchants. In 1991, in view of these enhanced all-around research activities, It was further decided to rename the Laboratory the Central Institute for Research on Cotton Technology (CIRCOT). During 1999, the institute celebrated the Platinum Jubilee. Presently, CIRCOT can boast an excellent infrastructure in the field of cotton testing and spinning, which is destined to play a vital role in promoting the best varieties and cater to the cotton mills of the country.

I dedicate this book to all those who contributed directly or indirectly in making this dream possible. Those dedicated artisans and engineers, both British and Indian, who built the spinning building in the early years and installed the spinning machines also deserve accolades. Obviously, all the directors, spinning masters, officers, research assistants, and other staff members, primarily those dedicated operatives of the Spinning Division who kept the spinning art so vibrant over the years, deserve special compliments in this endeavor.

RESEARCH BUILDING
(built in 1925)
Ground floor used for labs, a workshop, administration and a store room. The top floors were used as flats for the director and spinning master. Now it houses a decent guest house, canteen, computer information section, and some technical sections.

Extracts from Journals

1. The British Cotton Growing Association: (B.C.G.A) (1904-1954)

The British Cotton Growing Association has played a unique role at a time when the Lancashire Mills were starving for the raw material – cotton. This resulted in a heavy loss to the employers, and large-scale unemployment and hardship for workers. The dependence of American cotton, far away from thousands of miles, especially after the American civil war, resulted in an irregular and uncertain supply of raw material in the beginning. After the first World War this factor became a phenomenon. Often, it was due to the vagaries of weather conditions, political reasons, or changing requirements to domestic industries. Thus it was proposed to banish this constant threat by looking for suitable territories in the British Empire where the right kinds of cotton could be grown as ancillary sources of supply. It was a bold, pioneering adventure that could only have been conceived by men of vision, imagination and faith. Many prominent businessmen came forward.

But it can be truly said that Sir Alfred Jones and Sri. J. Arthur Hutton put life into the movement. The Association started in 1904 and a royal charter was granted. By the time it completed 50 eventful years, the cotton fields of the Empire produced a million bales a year. This ambitious program had constraints, such as the need for capital and expertise. Since it was a long time project, success could not be assured at all times. The promising cotton growing countries on the sight were Egypt, Sudan and India. Although India was the traditional cotton producing country of short staples, the cotton was not suited for Lancashire mills. Hence the Association, acting in co-operation with the Government of India, voted the sum of £3,000. A similar amount from the Government was to be spent on evolving perennial or tree cotton areas, where American long stapled cottons could be grown. In 1905, the sum of £10,000 was voted to be spent by the Government of India on research, but of this only £2000 were actually contributed.

In 1925, the government located a place in Punjab, where 7,200 acres in the Montgomery district was earmarked to produce superior quality cotton. Sir William Roberts was the chief project coordinator, of this B.C.G.A (Punjab) unit. The chief crops tried were cotton and wheat. The other subsidiary crops were grains and sugarcane. The success of the experiment was limited to the production of pure seeds. In 1948, the cottonseed sold by the association was sufficient for planting 100,000 acres. As for increasing the long stapled cotton growing area, the great continent of Africa provided ample scope for augmenting the cotton production. The countries of Uganda, Kenya, Tanganyika, Nyasaland, Rhodesia (North and south), and South Africa provided lots of opportunities for this ambitious scheme. Among them, the most promising was Sudan.

The two outstanding companies that stood the test of time were Sudan Plantation Syndicate (S.P.S), and the Kassala Cotton Company (K.C.C), for their splendid efforts in the Gezira Scheme for over a quarter of a century in producing Sudan Sakel cotton. The British built dams (near Sennar), harbors, roads, railways, schools, colleges, and hospitals, thereby improving the social and economic conditions of the local people.

Similarly, in 1917, the empire cotton growing committee was constituted. The Indian cotton committee was exclusively formed to look into the various aspects of the cotton improvement projects in India. The Government of India appointed a committee constituted as follows:

1 Sri. J. McKenna, Esq.; C.I.E; I.C.S.	President, Agrl. Adviser to the Govt. of India.
2. Sri. F. Hodgkinson, Esq.	Member of the Council of the B.C.G.A.
3. Sri.N. Wadia, Esq.	Member of the Commn. And Executive Ch. Of Bombay. Mill Owner' Association.
4. Sri. G.S. Henderson, Esq.	Member, Imperial Agriculturist (Officiating).
5. Sri. W. Roberts, Esq.	Member, Principal, and Professor of Aggrl College (Lyallapur Agro. College).
6. Sri. H.F. Ashton, Esq.	Member, Executive Engineer, Punjab.
7. Sri. F. Noyce, Esq. ; I.C.S.	Secretary.
8. Sri. J.B. Hutchinson.	Geneticist, Botanist, Institute of Plant Breeding Industry, Indore.

2. Indian Central Cotton Committee, The Indian Textile Journal Special Souvenir Number (1854 – 1954), p.481 by Dr. C. Nanjundaiah

Until the beginning of the present century, no progress in quality was seen until 1907. Scientific work for improving the quality of Indian cottons began with the establishment of agricultural departments in various provinces. This gave encouragement of the evaluation of pure types, possessing desirable agronomic fibre characteristics, by continuous processing of selection and hybridization. Not much work could be undertaken to improve the race of the plant, as until 1917 the bulk of the Indian cotton was short staple. There was a terrible shortage of American cotton after the first World War due to dislocation. The Government of India appointed ICCC to go thoroughly into all the aspects of the cotton growing in India; as a result of one of its recommendations the ICCC was

established in 1923. This body was provided with funds for the improvement of cotton growing, marketing, and manufacture of Indian cottons. It may therefore be said that systematic scientific work in the improvement of both quality and yield of Indian cotton commenced with the establishment of ICCC, although cotton manufacture on a commercial scale started at least a century earlier with the setting up of the first textile mill in 1818. ICCC prepared numerous co-coordinated schemes covering both aspects of cotton growing, namely, agricultural and technological work for the improvement of cotton cultivation in India. These schemes put into effect in collaboration with the agricultural departments on the one hand and the establishment of the Technological Laboratory at Matunga, Bombay on the other with an up-to-date spinning plant, equipped with testing capability for the scientific evaluation of the fibre properties, spinning performance, and yarn quality of Indian cotton.

Agricultural Research:

This included the improvement of the race of the plant by the application of plant breeding techniques. Specific schemes were started, which included botanical work for breeding high yielding superior types of cotton, entomological work for the study of life history of certain pests and measures for their control, mycological studies to counteract the effects of the fungal diseases, and physiological study for the efficient growth of the plant. Several cotton experimental stations created new varieties to replace the existing local varieties by pure line selection and hybridization methods; they also made arrangements for the multiplication of the improved seed and its distribution to the cultivators.

Technological Research:

As stated earlier, the successful evolution of a new variety also depends on technological work. Prior to the establishment of the technological laboratory in 1924, the cotton breeder had to depend mostly on the judgment of the expert grader for estimation of the quality of new cottons. It is common knowledge that this judgment, though fairly accurate in respect of existing varieties with which the grader is familiar, is open to large personal and subjective errors and no scientific breeding work could therefore be based on it as the ultimate test of a cotton is its actual spinning value. The technological laboratory has, among other things, thus filled a great void that existed in the earlier cotton breeding work. Over 22,000 new and improved strains have been tested for either the fibre properties, spinning performance, or both, and over 5,000 technical reports have been issued to the cotton breeders, which have contributed to place the breeding work for quality cottons on a sure and scientific foundation. It is interesting to observe that the assistance rendered to the cotton breeder has been

accelerated in recent years by the adoption of the improved small-scale spinning technique evolved at the laboratory, whereby a small quantity of lint obtained from an individual plant could be subjected to actual spinning test. Up to this time, the minimum quantity of lint required for a satisfactory spinning test was about 12 pounds, which obviously restricted the number of samples that could be tested in a cotton season and the stage at which a new strain could be tested during its evolution. With the development and introduction of a small scale spinning technique, it is now possible to spin as small a sample as 60 to 100 grams. (2-4 ounces) and this has enabled the breeders to obtain comparative spinning values of quite a large number of new strains in a much shorter period of time than before and at an earlier stage of propagation.

Improved Varieties:

The following are the improved varieties, which have been brought into general cultivation in the various states as a result of the application of the scientific breeding and technological work described above.

Bombay State:

Studies undertaken through the ICCC in the Dharwar tract resulted in the introduction of the wilt resistant hybrid variety called *Jayawant* which had at first replaced local kumpta. Later. two new strains called *Jaydhar* and *Lakshmi* proved to be wilt resistant, high yielding and superior in quality to *Jayawant* and *Gadag 1*, respectively; they are now being grown in large areas of this tract. In Khandesh, the local short staple N.R. variety was first replaced by an improved strain, *Banilla*, which was evolved by hybridization. This was later replaced by the wilt resistant and high yielding variety *Jarila*, which had found favor with the cultivators, and even spread to the adjoining tracts in Berar and Hyderabad. In the Surat tract, the local Surti was replaced at first by the improved variety *Surat 1027 A.L.F*, which in turn, was replaced in 1934 –35 by a high yielding and wilt-resistant variety called *Suyog*, which is now grown almost in the entire area of this tract. In the Broach tract, the local short staple *Goghari* was at first replaced by a superior variety called *B.D.8,* which in turn was replaced by a high ginning and more profitable variety called *Vijay* which now occupies the entire area in this tract. In the Dholleras tract, two local varieties called *Wagad* and *Mathio,* were at first replaced by an improved variety named *Wagotar,* which later on yielded its place to a still superior strain called *Kalyan*, which is now grown on an extensive scale.

Madhya Pradesh:

Due to a number of plant breeding, seed distribution and marketing schemes, the local improved short staple Desi variety *Oomras*, which occupied the major portion of the cotton area, was progressively replaced by new and improved varieties called *Verum 262, V.434* and recently by *H.420*, which is capable of spinning 32s counts as against 8s/10s of the Desi Oomras. The area of the improved strain H.420 is now being extended on a large scale. The introduction of American varieties has resulted in new strains called *Buri-107* and *Buri-0394*.

Madras State:

There are a number of distinct cotton-growing tracts in this state that are known as Cambodias, Tinnavellys, Westerns, Northerns, and Cocanadas. The most important improved varieties are CO.2, C03, and C0.4/B.40 (Rajapalayam) in the Cambodia tract. H1 and N.14 are used for the Westerns and Northern regions, and K.2 and K.5 for the Karunganni tract.

Punjab State:

Due to Partition, a number of improved and superior long-staple varieties such as 289 F 43, 289 F/ K 25, 124 F and 199 F that were specially evolved to suit the canal irrigated areas in the Western Punjab have now gone to Pakistan ICCC to prepare both immediate and long term schemes for the cultivation of as many superior strains as possible in the Eastern tract. Two new improved strains were 'P.A-LSS', and 'P,A.216 F' now grown extensively in Eastern Punjab and PEPSU states.

Hyderabad State:

Hyderabad state is the third largest cotton growing tract in India. An improved strain called *Gaorani 6* has replaced the indigenous local *Gaorani* in the north eastern tract. A new variety called *Gaorani-12* has replaced the local Oomras in the south west part of the state. Two improved strains, *R.K19*. and *Jayawant,* are being grown on an extensive scale in the Raichur district.

Mysore State:

A new long staple variety, *M.A.V.,* suitable for the Irwin canal area, has been evolved and is now being grown on a large scale. Furthermore, experiments are under way for the introduction of Egyptian varieties in the irrigated tracts.

Madhya Bharat:

Fundamental research on the genetics and agronomic and physiological aspects of cotton breeding, carried on for many years at the Institute of Plant Breeding Industry, Indore. This research has proven to be immensely valuable to cotton breeders throughout India. Selection work on indigenous cottons in the central lndia tract led to the evolution of *Malvi 9*, which is better in quality and yield than the local cotton. Suitable strains of Cambodia and Buri have been evolved for the Nimar tract of Indore and some parts of Gwalior. Seeds of these improved varieties are now being distributed to cover a large part of this state.

On the agronomic side, several investigations have been undertaken at The Institute of Plant Breeding Industry, Indore. A new compost has been developed, which is considered a valuable manure and is now widely adopted in agricultural practices. The Institute is also engaged on a new physiological research scheme, the object of which is to obtain precise knowledge of the inter-relationship between the soil and climatic factors and the growth of different varieties of cotton. It would be interesting to mention that new lines of work for breeding superior long staple varieties have been undertaken by ICCC, one of which is the inter-specific hybridization scheme at Surat. This work consists of crossing American and Indian cottons, which have intrinsically different genetic characters. Some promising crosses, such as 170- Co2 and B.C. 68 x 22, have been evolved by employing a drug called *Colchicine*. These crosses were found to be much superior in respect of staple length, fibre fineness, feel, and spinning value to the existing improved variety *Suyog*. Similar work is also being carried out at Coimbatore and Dharwar.

Furthermore, a scheme for growing of Sea Island cotton in a rain-fed condition on the slopes of the west coast of India (Malabar) is now in progress. Some of the varieties evolved were found to possess more or less the same fibre characteristics as their parents grown in the West Indies. It is interesting to note that Sea Island cotton grown in India is spinnable up to 120s count and was judged suitable for manufacturing superior hosiery yarn and sewing threads.

It is seen that because of Partition, 25% of the total area, which was mostly under irrigated crop, and 38% of the total production, mainly long staple varieties, have gone over to Pakistan. In addition, against the total requirement of 38.6 lakhs of bales by the mills in the Indian union, the

total production was found to be only 22 lakh bales, which is less by about 43% of the mill's requirements.

Thus, the problem of supplying adequate quantities of medium and long staple cottons particularly of 7/8" staple and above had to be faced because of Partition. Besides, there was a curtailment of the land area for cotton to meet the shortfall in the food crops. This depressing state of affairs called for a radical reorientation of the pattern of cotton production in the Indian Union. Consequently, the ICCC lost no time in preparing immediate plans in collaboration with the state agricultural departments to produce an adequate quantity of cotton in the country of the types comparable to that lost to Pakistan, and to breed extra-long staple varieties suited to Indian conditions. It is gratifying to record that considerable headway has now been made to attain these objectives. Numerous plans have been put into operation to evolve better and high-yielding varieties and to improve the yield of existing medium and long staple varieties, with favorable results. Nearly 48% of the acreage used improved varieties in 1949-50, 50% in 1950-51 and 54% in 1951-52.

3. Extracts from "40 years of progress" - by Dr. R.L.N. Iyengar (1924 –1964)

The Indian Central Cotton Committee (ICCC) founded the Technological Laboratory in 1924, exactly 40 years ago. It was almost the first act of the Committee soon after the Government of India in the Department of Revenue and Agriculture constituted it on March 31, 1921, and quite appropriately so, in view of the essential need for an authoritative and scientific estimation of the inherent quality of the new varieties of cotton evolved. The funds of the Committee are derived from the cotton cess of two annas/bale (for the first 4 years it was charged 4 annas/bale) imposed in 1923. The Laboratory was the only one of its kind in Asia for a long time and played an important role in the development of the Science of Cotton Technology. By testing and evaluating the true spinning value of a large number of strains evolved by the cotton breeders, the laboratory has helped the Agricultural departments of the various states to produce improved varieties. As a result of these activities, cotton production in India has increased to about 50 lakh bales during the recent years, sufficient to meet the requirement of the textile industry, except for five lakh bales of extra-long- staple, which cannot be grown in this country at present economically in relation to other crops.

Extensive research has been carried out on the physical properties of the fibres and their relation to the spinning value. Many instruments and machinery have been designed and fabricated by the laboratory. Ginning research has been carried out to improve ginning in the country. Tests on trade varieties are made annually and the results furnished for the use of the trade and industry. I.C.C.C had the advantages of considering the results which have been obtained by research department of

the Fine Cotton Spinners' and Doublers' Association in Manchester. Dr. Balls and his colleagues have shown the direction in which laboratory investigations and experimental spinning trials can be brought to bear on each other, thus showing the necessity of conducting spinning on small trials. The ICCC therefore endorsed the recommendation that the technologist should be equipped with a complete miniature spinning plant and it has been definitely ascertained that such a plant is practicable and that it can be suitably designed for experimental work. Advantage of facilities for such tests to a plant breeder at an early stage of his work is obvious. Technicians are trained in testing and fitters for ginning. The chief functions of the laboratory are:

a) To help the Agricultural Departments in evaluating the quality of new strains evolved.

b) To help the Trade and Industry by furnishing true valuation of different trade varieties cultivated.

c) To issue Authoritative Reports on the samples received from the Trade and other Sources,

d) To carry out basic research on the physical and chemical properties of cotton in relation to quality and spinning performance of cotton.

e) To carry out investigations on the ginning problems of Indian cottons.

f) To investigate the greater and better utilization of cotton, cotton wastes, linters, cottonseed, and to disseminate technical information.

4. Extracts from 'Indian Cottons': Directorate of Cotton Development: October 1973.

American cottons were introduced to India by the end of the 18th century. The cottons were of perennial variety and Bourbon. The East India Company supplied varieties like New Orleans and Georgian upland cottons to the Bombay province in 1828. They were acclimatized in upper Karnataka and came to be known as Dharwar American cottons. From 1842 to 1906, New World cottons were tried in different parts of the country, especially in Tamil Nadu, West Bengal, Maharashtra, Mysore, and Madhya Pradesh. Although the performance was not encouraging in the beginning, it laid the foundation for present day American cottons. In 1906, seeds of *CAMBODIA* cottons from Indo-China reached Pondicherry as a mixture in the imported lint, and were tried in Tamil nadu as an irrigated crop. After years of cultivation, it was observed in 1906 that this variety had immense potential and was ideally suited as an irrigated crop. This Cambodia cotton (Co2) spread to Malwa, Madhya Pradesh, and the Kahthiawar area in Gujarat. In Punjab, a private firm collected seeds of stray hirsutum plants at the beginning of the century, which laid the foundation for Punjab American cottons. *Mollisoni* was the short staple variety grown in Uttar Pradesh and Punjab. From 1897 to 1898 Sri. Mollison, a Canadian, was serving as the Deputy Director of Agriculture. The variety is named after him.

The Site for the Technological Laboratory: Source: Annual Reports (ICCC 1922-28)

The site for the Technological Laboratory is situated at King's circle, Matunga, about 8 miles to the north of center of the city. It lies in pleasant surroundings on land which is just being developed for residential purposes by the Bombay Improvement Trust. The site is less than 200 yards from 'The Victoria Jubilee Technical Institute' (Now Veermata Jijabai Technical Institute). The plans of the I.C.C.C. contemplate the erection of two buildings on the plot of land secured, one to have installed within it an experimental Spinning Plant, and the other to provide accommodation for a Research Laboratory. Already the building for the Spinning Laboratory has been erected; the necessary plant has been installed and is now running satisfactorily. The building is a single storey brick building, rough cast on the outside; the floor is paved and the roof constructed of reinforced concrete slab over steel beams and girders. The building is 24 feet high and has a total floor space of about 6,200 square feet. The western side of the building is occupied by a cotton sample room having a floor space of 230 square feet and the Blow Room having a floor space of 850 square feet. The central part of the building is occupied by the spinning room having a floor space of 3,450 square feet. On the eastern

The Spinning Room from the Southeast Corner

side is a testing room with a floor space of 750 square feet; office and switchboard room with a floor space of 350 square feet and a store room with a floor space of 400 square feet. Arrangements have been made to ensure that the light is for the most part a north light. The greater part of the lighting of the main spinning room is from the roof through windows forming the north side of a reinforced

concrete erection having rectangular cross section; this is supplemented by light from a number of wall windows on the north side. The rooms on the eastern and western sides are lighted by means of windows on the outside walls. It is interesting to note that the machines arrived in 1924, which were manufactured in the same year; interestingly they were installed and by the year-end spinning trials were conducted! An Amazing feat indeed! Initially for comparing the spinning values, the cotton samples were sent to England and trials were taken at "Oldham Master Cotton Spinners' Association" carried out at Lancashire Mill conditions.

Research Laboratory:

The laboratory is a rectangular three storey building of approximately 6,200 square feet. The ground floor is entirely to be used for laboratory rooms to study Physics, Chemistry, Microscopy and colloids, and for a Library, Workshop and Storeroom. The top floors are exclusively used as flats for the Director and Spinning Master; if future extension is needed for the laboratory same can be adjusted in future. Tenders are called from the contractors in 1924. Building operation begins on 1st September and the whole building is expected to be completed by the end of May 1925 (Occupied in September 1925). Till the work is completed, scientific work has to be carried on in a room at V.J.T.I placed at our disposal by the trustees. The room measures 50'x30', with little modifications can be used by Director, clerk/typist. Provisions also made to supply gas, electricity and water. Laboratory benches in use both in the Research laboratory and also in Testing room have been designed on the 'unit principle' of Dr. Balls so that the varying needs of the laboratory may be accommodated at any time with the most economy and efficiency. In this temporary laboratory the following instruments


The Spinning Room from the North-East corner.

The Spinning Room from the Northeast Corner Mule machine is partly visible

were brought, which the cotton specialist can use:

Instruments:

1.	Two Microscopes
2.	Dissecting Microscope
3.	Schanze Microtome and Accessories
4.	Latest equipment

The spinning section was supplied by T&S Company machinery from England. The details are as follows:

Western Partition Wall	Eastern Partition Wall
Blow Room	Nasmith comber (Motor driven)
1.Lattice feeder, 2. Crighton opener	Sliver lap machine
3. Hopper feeder 4. Scutcher	Ribbon lap machine
Carding –2 (T&S) Revolving flat cards.	Line shaft driven by 15 H.P Motor.
Draw frames –3 (T & S)	
Slubber –1, Inter –1, Roving –1	
Ring frames –2 (48 Spdl/machine)	
Self acting Mule – 194 spindles.	

The Director was appointed on October 1923 but took charge on 1st January 1924.The first director was Sri. A. J. Turner M.A. B.Sc; Sri. W Briggs was appointed on March 1, 1924,as Spinning Master. He had to resign the job for health reasons and left the country. The temporary spinning master was Sri .E. B. Walmsley. Sri. R. P. Richardson took charge from him after six months. The staff under the first director was as follows:

Director:	Sri. A. J. Turner
Spinning Master:	Sri. E. B. Walmsley
Chemist:	Sri. D. L. Sen
Microscopist:	Sri. H. N. Dutt
Statistician:	Sri. Venkataraman
Electrician:	Sri. K. S. Venkatram
Physics (Res Student):	Sri. N. Hari Rao
Testing Assistants:	Sri. Tarkundey & Sri. P. Madhava Rao
Clerk:	Sri. N. A. Gadre
Typist:	Sri. B. P. Jain

Staff strength of CTRL/ CIRCOT:

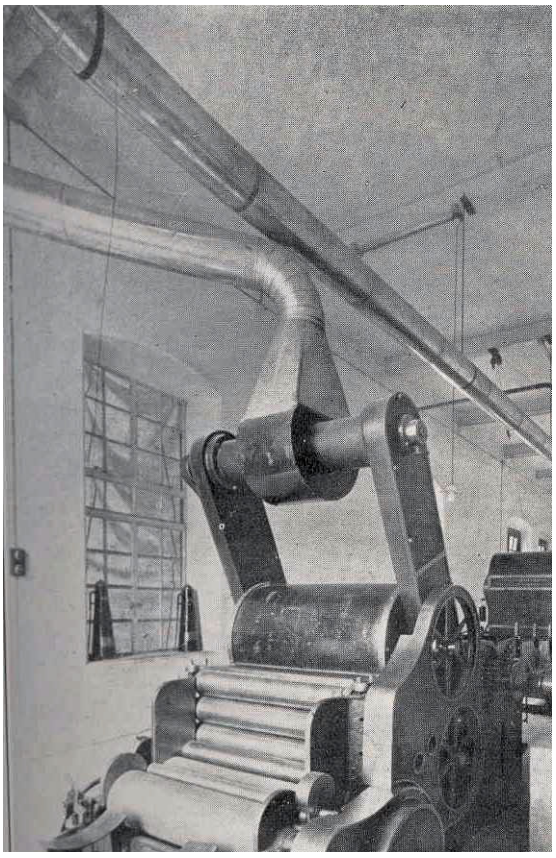
Details of the Staff working at CTRL/CIRCOT.	1924	1966 *	1991 **	2004 ***
Scientific & Technical		65	190	147
Supporting and Administrative		76	133	115
Out station		19		53
Total	11	160	323	315

Headquarters at Mumbai: Land 6,845 square meters, 4 buildings, total builtup area 88,000 sq. ft. **

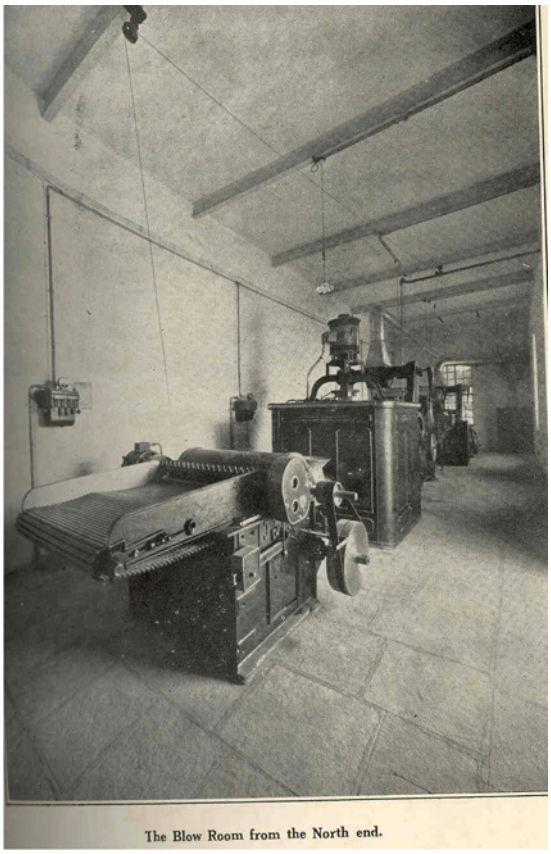
* As per " fifty years of research" –Dr. V.Sundaram

** As per "Technological Research at CIRCOT since Independence 1947-1997" by Dr. KRK Iyer.

*** As per the information provided by Adm-1



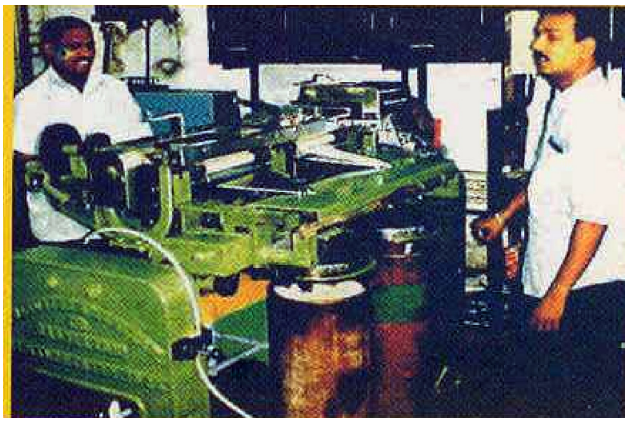
Blowroom as seen from south end



The Blow Room from the North end.

Blowroom as seen from north end

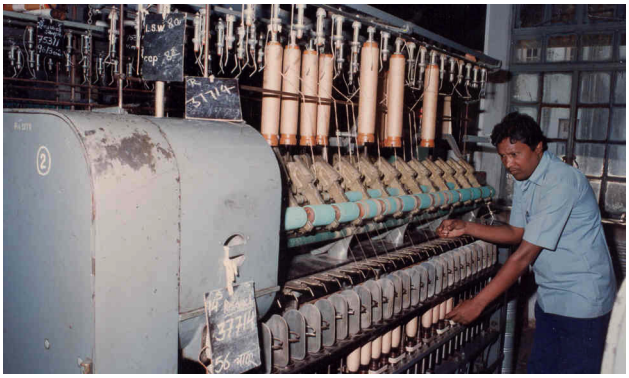
Sri M.R. Nevrekar is opening the micro samples with a pinjari.



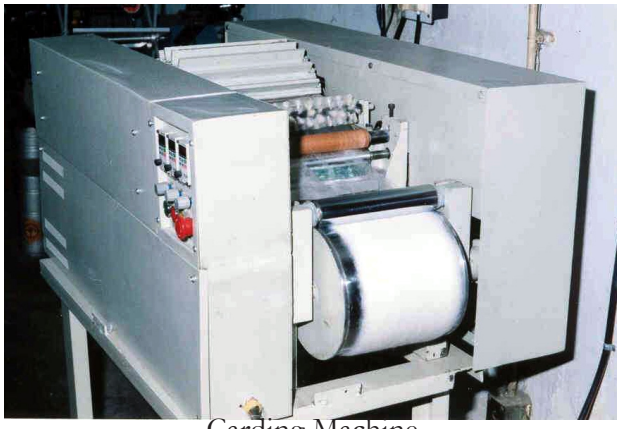
Sri G.G. Ambare is working on Micro Miniature Drawing machine. Sri S.A. Phalke is helping the processing work.

Six slivers are passed through the coiler calender roller and made into one.

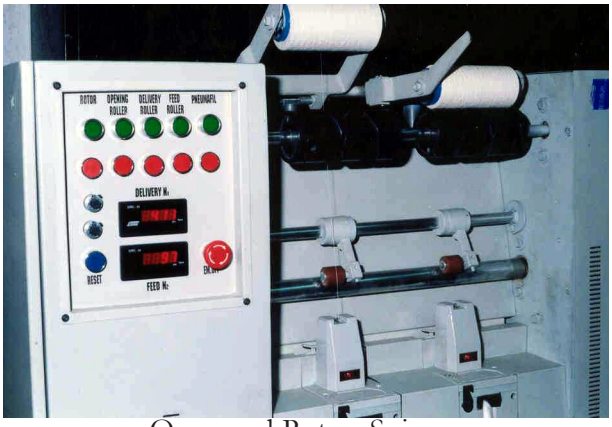
Sri G.S. Deorukhar is working on Slubber Machine.



Sri B.R.Jadhav is working on Ring Frame



Carding Machine



Open end Rotor Spinner

Drawframe

Sliver to Yarn Spinner

DIRECTORS

Arthur James Turner, C.B.E.; M.A.; D.Sc.; F.T.I.; (January 1924 – December 1930)

ARTHUR JAMES TURNER

Dr. Turner was the first director of the technological laboratory, Bombay. This laboratory, the first of its kind in the east, came into existence at a time when the science of Cotton Technology was in its infancy. It was called upon to tackle the fundamental problem of evaluating the factors that go to determine the quality of cotton. Under the guidance of Dr. Turner, a good start was made to evaluate the available popular cottons in a systematic manner. New American varieties were tried at various places starting from Punjab to Tamil Nadu. Dr. Turner was a scholar of Gonville and Caius College, Cambridge. In 1912 he joined the staff of the National Physical laboratory, London, to do research work on aircraft material. In addition he obtained a first class Bachelor of Science degree from London University. Appointed head of the fabrics research section at the Royal Aircraft establishment at Farnboroug, Kent, he organized a great variety of research on latest yarns and fabrics. His intensive textile research at Farnborough led to his appointment in1919 to the newly established chair of Textile Technology at Manchester, which he held until 1923. For some time he served this organization as the head of the fabrics research section at the Royal Aircraft establishment at Farnborough. He organized a great variety of research on textile yarns and fabrics. This included the work for which he was later awarded the degree of D.Sc from London University. Later, he proceeded as the director to the research organization of the Indian Central Cotton Committee (I.C.C.C), Bombay, where he built a team of trained Indian staff and organized a comprehensive program of research. Of the many reports that were published regularly, those dealing with standard Indian cottons took a place of pride. His compiled research study on the cotton fibres published under the heading 'The foundation of yarn strength' is regarded as the monumental work of reference for the cotton scientists to this date. After working in India for 6 years, he was appointed head of the spinning department at the British cotton industries' research association in 1930. While he was in Bombay, whenever he went on

leave Sri. W.G.P. Wall, M.Sc, I.E.S, acted in his place (United Provincial Government had made this arrangement). In later stages, during a period of absence, Sri. Richardson took charge of the office. Dr. Turner's services to science and technology were recognized by the Textile Institute's 'Warner' medal in 1931. Later, he was asked to accept the post of a director of research of the Linen and Research Association in 1940. The last 16 years of his working life were spent at Lambeg. Dr. Turner began his work shortly after the outbreak of war and he lent his energies to harnessing the research association to the war effort. His constant aim was to direct the research work at Lambeg to the linen trade. From there, he retired in March 1956. Dr. Turner was the member of the textile institute as early as in 1919. The outstanding work done at the Institute culminated in his election to the presidency in 1952, an office which he held for two years. He was elected as a 'fellow' in 1940.

Dr. Turner served on the council of Textile Institute, Manchester during 1941-48 and as a vice president during 1949-52. His wide interests in the institute activities were evident by his long service on diplomas committee (24 years), Journal publication committee (15 years), and U.T.M.C. (19 years), and two of its technical centers. He was also a member of his local section committee in Northern Ireland during 1941-51. The 'C.B.E.' was conferred on him in 1950. Later, he visited Bombay as a technical adviser to BTRA during 1958. This was in connection with the setting up of a full-fledged research laboratory to cater to the research needs of the mill industry. He also visited CTRL and appreciated the all round development.

Dr. Turner passed away in October 1971 at the age of 82. His contributions as a director of the technological laboratory, where he established excellent research facilities while developing the quality of Indian cotton fibres will be remembered forever.

Dr. Nazir Ahmed. M. Sc.; Ph. D. (Cantab); F. Inst P; (December 1930 – October 1945)

Dr. Nazir Ahmed succeeded Dr. Turner as the director of the laboratory in 1930. Dr. Ahmed did his graduation at the M.A.O. College Aligarh and Government College Lahore. He earned his M.Sc. and Ph. D. degrees at the Cambridge University in 1923 and 1925, respectively, after conducting research in Atomic Physics under the guidance of Lord Rutherford in the Cavendish Laboratory. On his return to India, he took charge as the head of the science department at the Islamia College, Lahore. He was also a member of the Punjab Provincial Research Council.

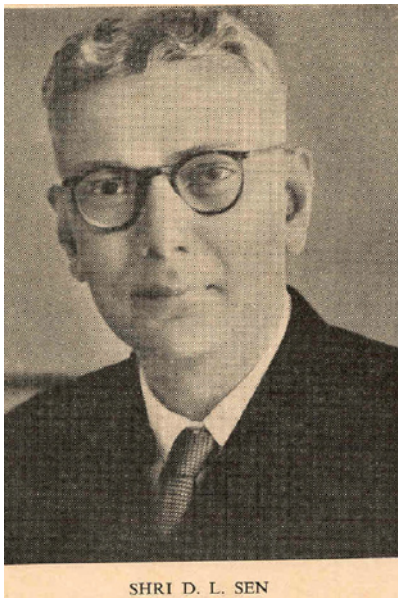
Dr. Ahmed joined the technological laboratory as Assistant Director in 1930. In December 1930, he assumed the charge of the Director and held this post for an eventful period of fifteen years. In the course of those years, he published scores of research papers dealing with almost all of the technological aspects concerned with cotton fibres and their processing into yarns, and devel-

oped number of instruments for the determinations of various fibre properties of cottons. Amongst these, his contributions in developing instruments for the determination of the length parameters and individual fibre strength of cotton fibres deserve special mention.


DR. N. AHMAD

Dr. Ahmed took active interest in various technological and educational fields and was a Fellow of the Bombay University and a member of the board of management of the VJTI and of the Board of Visitors of the Department of Chemical Technology of the Bombay University. In addition, he was closely associated with the Imperial Council of Agricultural Research, the Council of Scientific and Industrial Research, the Textile Association of India and the Rayon and Artificial Silk Panel. He toured England and America as a member of the delegation of Indian Scientists in 1945. He studied the latest development in Science and Technology in those countries. He relinquished charge of the post of the director in the same year and was appointed a member of the Indian Tariff Board. Later, when India was partitioned in 1947, he migrated to Pakistan. As the second Director, he laid a firm foundation of excellent research work culture and guided his fellow workers who later excelled after him and contributed immensely to basic cotton research.

Sri D. L. Sen, M. Sc., M. Sc.Tech.(Manchester), A.I.I.Sc.; F.R.I.C.; (October 1945–March 1951)


SHRI D. L. SEN

Sri Dhires Lobha Sen became director of the laboratory after the retirement of Dr. Nazir Ahmed in 1945. After graduating from the Dacca Government College in 1918, he carried out postgraduate research under the guidance of Sir P.C. Ray at Calcutta. On being awarded a research scholarship at the Institute of Science, Bombay, he obtained the Diploma of Associate ship of the Institute under the guidance of Dr. G.J. Fowler. He obtained an M. Sc. degree from Bombay University in 1921 and was awarded the 'Moos Medal.' He went to England, joined Victoria University in 1923, and secured an M. Sc. Tech. Degree. When he returned to India, he joined the Technological Laboratory, Bombay, as a chemist and subsequently as the first senior research officer. His work in fumigation of American Cotton us-

ing hydrocyanic acid gas along with Dr. Turner is very much appreciated and the method was adopted by the government of India to prevent the entry of boll weevils into the country along with imported American cottons.

Sri Sen was in charge of the moisture testing section, specially maintained by the laboratory, at the cotton exchange at SEWRI for about a decade. In 1935, the central cotton committee deputed him to England for specialized training in dyeing, bleaching, sizing and finishing under professor F.Scholefield at the college of technology, Manchester. On his return, he was appointed as the superintendent of the testing house of the laboratory. In 1936, Sri Sen was elected a Fellow of the Royal Institute of Chemistry of Great Britain and Ireland. He became the officiating Director of the Technological Laboratory in 1945 and was confirmed as director in 1947. Sri Sen was associated in the various aspects of cotton research, such as fibre and yarn testing, development of new techniques like micro spinning, chemical processing etc. Sri. Sen retired from the service in 1951. He joined the Technological Institute of Textiles, Bhiwani, as its Principal. During the golden jubilee celebration of CTR in 1974, Sri Sen was invited as one of the chief guests.

Dr. C. Nanjundaiah, M. Sc.; Ph. D.; F.T.I.; F.N.I.; (March 1951 – September 1956)

DR. C. NANJUNDAYYA

Sri. Chandrasekharaiah Nanjundaiah was born in Mysore. He obtained B.Sc (Hons) in physics and mathematics in 1924 from Bangalore. He worked under Sir C.V. Raman at Calcutta for two years and also obtained a M. Sc. degree. Later on, he secured a Research Scholarship in cotton technology by I.C.C.C at CTRL in Bombay, on March 15, 1928, where he worked for two years with Dr. A.J. Turner. He was appointed Textile Physicist in 1930. Many of his research papers were published in reputed Indian and International journals. He devised A. N. Stapling Apparatus for measuring staple length of cotton in association with Dr. Nazir Ahmed, the second director of the laboratory. Other works involved measuring the frictional force between cotton fibres in the ginning of cotton, and the effect of moisture on fibre/yarn. In 1947, Government of India deputed him to England for advance training at the Manchester College

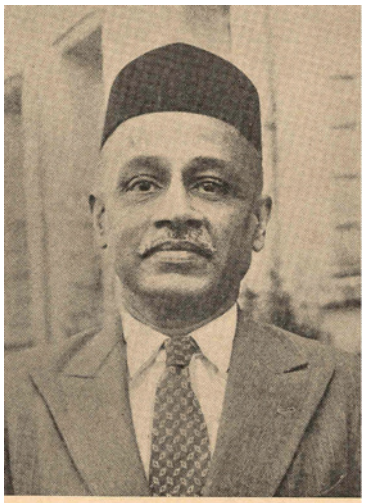
of Science and Technology under the guidance of Dr. W.E. Morton that led him to Secure a Ph. D. degree. Later, he went to Leeds University and worked with Sri. H.J. Woods on X-ray diffraction studies of the fine structure of fibres. Later in 1949, he was deputed on a study tour to USA for a few months. He was awarded the Fellowship of the Textile Institute (FTI) in 1950. It is very interesting to recall that Sir C.V. Raman visited the Technological Laboratory during his tenure as the Director.

Dr. Nanjundaiah succeeded Sri D.L. Sen as the Director of the Technological Laboratory in 1951. There was a proposal to start one more research organization to solve the problems faced by the textile industry in Bombay. In 1956 BTRA was formed and he was offered the post of its Director. He was responsible for setting up the Laboratory as well as for guiding and coordinating all activities of this new institution till 1970. Dr. Nanjundaiah started building up the Pilot plant, library and other infrastructures virtually from scratch. A temporary building was used first. The practical work was conducted in mills, but new buildings gradually took shape on a 24-acre site, and in 1960 saw the official opening by the then president of India. BTRA had to be equipped with the facilities to train its own staff and later to provide the consultancy and technical services to the member mills. Fundamental and applied research has to be carried out to solve the operational problems of the industry!

Dr. Nanjundaiah worked very hard and made BTRA one of the foremost research organization in the country. His Guru, Dr. Turner visited the organization in 1958, to advise the Bombay Textile Research Association to plan out and set up their institute, praised him for the exceptional way he carried out the developmental work. BTRA is recognized as the center for M.Sc. and Ph.D students. Dr. Nanjundaiah was the president of the Bombay Productivity Council and also president of Rotary club of Bombay. He was honored by the award of fellowship of the National Institute of Sciences of India (F.N.I). He was the first Indian to be elected as the Vice President of The Textile Institute at Manchester (1962-1966). This was a great honor to the staff of CTRL as well! He was the project manager of a United Nations (UNIDO) Project for Textile Quality Control at Alexandria, A.R.E during 1970s. Dr. Nanjundaiah is remembered as a dynamic and highly resourceful director of CTRL. He passed away on March 29, 1987 at Bangalore.

Sri Harirao Navakal, M. Sc.; (Officiating Director, September 1956 – January 1957)

Sri Harirao Navkal did his graduate studies at the Central College, Bangalore, and later took the Master's degree in Physics with high distinction from the university college of science, Calcutta, after pursuing studies under the guidance of the eminent Indian Physicists, Nobel Laureate Sir C.V.Raman and Prof. Meghnad Saha. Sri Navkal was amongst the first few persons to join the CTRL in 1924 as research scholar. He was appointed as junior research officer in 1925 and as senior physicist in 1929.


SHRI H. NAVKAL

His designation was changed to senior research officer in 1954. Sri Navkal took charge as officiating director when Dr. Nanjundaiah retired from service in September 1956, and held this post till January, 1957. Having joined the laboratory in its year of establishment, Sri Navkal was responsible for setting up the fibre and yarn testing divisions and standardizing various test methods. He trained the members of the staff and also the personnel deputed by the industry in the methods of textile testing and research until his retirement. He was associated with all the directors in the research projects and also the spinning masters. The studies included inter-relationships between important fibre properties as well as the effect of fibre parameters on yarn quality. A major part of his career was directed to the solution of the very important problem of prediction of yarn quality of cottons from their chief fibre properties. Even after retirement from the service in January 1959, he took keen interest in the activities of the institution.

Dr. R.L.N. Iyengar, M. Sc., D. Sc.; F.T.I.; (January 1957 – September 1966)

Dr. Ramaswamy Lakshmi Narasimha Iyengar took over as the Director of the Laboratory from Sri Harirao Navkal in January 1957. He did his M.Sc. (Physics) from the University of Mysore. He had the distinction of being the most brilliant student and was awarded merit scholarships and prizes during his educational career. He joined the technological laboratory as a research scholar on April 1, 1927 and worked under Dr. Turner, the director of the laboratory. Sri Iyengar was sent to Coimbatore centre to conduct special studies on variations in the properties of cotton fibres brought about by different genetic and environmental factor. Madras University was very much pleased with his work, which was relatively new in nature, until then unexplored by the fellow scientists. In recognition of his extensive work in cotton development. he was awarded D.Sc. degree in 1943. Dr. Iyengar returned to Bombay in 1941 and was appointed to the post of Junior Research Officer. He was later promoted to the post of senior research officer in 1953 and ultimately was elevated to the post of the director in 1957.


DR. R. L. N. IYENGAR

Dr. Iyengar has contributed immensely to cotton research all

through his career, starting as a research scholar to the post of director. He took great interest in studying the fibre length variation along the surface of the cotton seed and other fibre properties. Among other things, his investigations on the strength of attachment of the cotton fibre to the seed has been widely acclaimed world over. Other studies being improvement in ginning, moisture relations of fibre yarns and fabrics. It is interesting to note that he designed many instruments. Some may say they were very simple but when devised for the first time, they were widely accepted, The ginning percentage balance, the Leaf-vein toughness tester, the photo-electric mean fibre diameter tester, the strength tester and the impact tester are in constant use even today. Dr. Iyengar has conducted number of studies and published numerous research papers in Indian and International journals. He was deputed to London during 1965 by the Government of India as a member of the Indian delegation to the ISO meeting.

Dr. Iyengar relinquished his office in October 1966. From 1967 to 1972, Dr. Iyengar was an Emeritus Scientist attached to the laboratory, and conducted studies on developing simple equations for predicting yarn properties from the chief fibre properties of cotton. As in the past, he guided students for post-graduate degrees of the Bombay University. His advice and keen interest in the activities of the CTRL continued till his death. He was responsible for the expansion program of the laboratory, which involved a sum of Rs 15 Lakhs. He is also an author of a book, "Methods of test for cotton yarn fabrics," along with Dr. V. Sundaram.

Dr. Iyengar passed away at Bangalore on 18th September 1992.

Dr. V. Sundaram, M. Sc.; Ph. D.; F.T.I.; (1966-1988)

Dr. Sundaram earned his Ph. D. from the Institute of Science, and joined the Technological Laboratory at Bombay in 1954 as a Junior Research officer. Within a short period of 12 years, he rose to the position of the Director of the laboratory (October 1, 1966), During that time, the administrative functions changed hands from ICCC to ICAR. This change was a turning point in the history of the laboratory, as well as in the career of the new director. With the launching of the All India Cotton Improvement Project (AICCIP) on April 1, 1967, the Director was entrusted with the task of Principal Investiga-

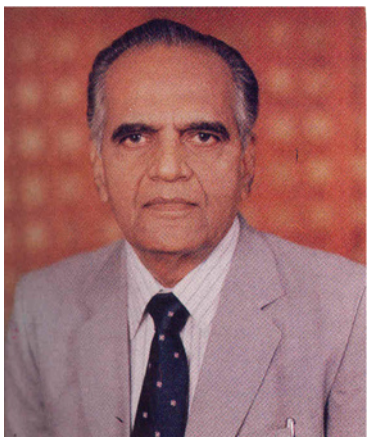
tor (Technical). Many innovations took place during this period. The laboratory was expanded, a new building was built, and latest scientific instruments were installed. His 22 years as director brought progress in the working methods due to the installation of modern instruments in all the sections. Spinning section underwent modernization in a major way. In the past, all the machines were driven by a single line shaft driven by a 15 H.P. Motor. This shaft was dismantled and most of the machines were driven by individual motors. The Platts blow room was commissioned. The NMM cards, LR drawing, and speed frame, LR comber, sliver lap machine, LR ring frame, OMS drawing and ring frame, OE etc. are some of the new instruments present. The knitting section was started with latest knitting machines. F.T, Y.T, Chemistry and other sections were provided with state-of-the art testing instruments. The AICCIP proved to be very successful. Dr. Sundram and his team won several awards which are listed below:

1. One of the recipients of the ICAR awards for team research work.
2. Indian merchant chamber award for outstanding contribution in the field of agriculture in 1976.
3. FICCI award for outstanding achievement in research, science and technology in 1977.
4. Dr. Sundaram was a member of the task force, constituted for setting up the CICR at Nagpur.

He also functioned as the director of this Institute during January 1976 to February 1977. He published about 200 scientific papers in International and Indian journals.

Dr. Sundaram revised the handbook of the laboratory entitled 'Handbook on methods of tests for cotton fibres, yarns and fabrics' published by Dr. RLN Iyengar. He was the Editor of the magazine Indian society for cotton improvement (ISCI), untill his death in 2003.

Dr. V. Sundaram died of heart attack on 29th January 2003 at Delhi.



Dr. N. B. Patil, M. Sc.; Ph. D.

Dr. Patil joined CTRL on August 4, 1969 as SSO. He was working in ATIRA, Ahmedabad, as a scientific officer. He has published number of research papers in Indian and International journals. During his time the name of the Institute changed from CTRL to CIRCOT (Central Institute for Research on Cotton Technology). Dr. Patil worked as acting director for few years. He retired from service on December 31, 1994.

Dr. S.N. Pandey, M. Sc.; Ph. D.

Dr. Pandey joined CTRL as officiating Jr. Research officer on December 17, 1959. The grade was upgraded on June 21, 1962. He obtained the SSO post on June 28, 1969 in the place of Dr. Betrabet, and was promoted as Chemist on August 4, 1975, S-2 in October 1, 1975, and S-3 on July 1, 1980. Dr. Pandey worked at CTRL as a senior scientific officer before taking over the director's posts at NIRJAFT and CRIJAF. He became the Director of CIRCOT on February 23, 1995. He was the first director to arrange an International Conference at Lila Hotel, Mumbai. He has authored many books, and guided M. Sc. and Ph. D. students, He is the recipient of many prestigious awards. After retiring on August 1,1995, he became the chairperson of the Indian Fibre Society (IFS).

Dr. Krishna Iyer, M. Sc.; Ph. D.; F.T.A.; (1995 – 2000)

Dr. Krishna Iyer completed his M.Sc in first class at the Kerala University in 1962. He joined Ramnarain Ruia College at Bombay and served for three years as a lecturer in Physics till 1966. He joined ATIRA, Ahmedabad, as a research Fellow in Physics for doctoral degree from the Gujarat University. In the early 70s he joined the Central Institute for Research on Cotton Technology as a Scientist, and rose to the position as the head of the department of Physics in 1988. He took great interest in the study of fibres, yarns and fabrics. Dr. Krishna Iyer had an inquisitive mind and was always interested to know more about the structure of the cotton fibres. He and his colleague Sri G.F.S. Hussain devised a fibre length measuring instrument, known as *Inter ferrometric fibre stapler*.

As the Director, Dr. Iyer's achievements were manifold. He worked late hours, seven days a week, and was available at all times. He used to arrange seminars, symposiums, and workshops at five star hotels and noted places. The institute acquired large amount of grants and recognition by the top bosses housed at Delhi. At the same time CIRCOT also generated more money by attending to paid samples. NABL accredited CIRCOT. Dr. Iyer. visited USA, UK, France and Sudan to attend seminars or for

giving expert advise.

Dr. Iyer was fortunate to organize the 'Platinum Jubilee' of CIRCOT where he demonstrated his organizational skills and maturity of mind. All the sessions were ably conducted by the selection of eminent personalities as chairmen and speakers from a cross section of the textile industry. This event will go down in the history of CIRCOT. Dr. Krishna Iyer has published nearly 100 papers in Indian and International Journals. He has been a co-author/co-editor of four books. One of them, 'Handbook of cotton in India,' was released at the inaugural session of the International Seminar organized jointly by CIRCOT and ISCI in December 1999.

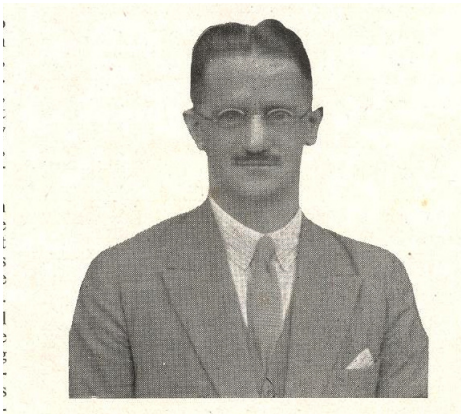
Dr. Krishna Iyer laid down his office on August 1, 2000. He is still actively engaged in associating himself as the Vice Chair person of the Indian Society for Cotton Improvement (ISCI). He will always be remembered for his helping nature and kindness toward the staff members.

Dr. S. Srinivasan, M. Sc.; Ph. D.; F.T.I.; F.T.A.;

Dr. Srinivasan is the Director of the Institute at the time of the writing of this book, He joined CTRL on September 2, 1974 as a research assistant. When the ASRB was constituted, he was inducted in scientific grade S, on October 1,1975, and promoted to S-1 in July 1, 1976. He obtained his Ph. D. in Physics from the University of Kerala in 1980. He was promoted to S-2 in July 1, 1982. He is the Chartered Textile Technologist and a Fellow of the Textile Institute, Manchester, and also a Fellow of Textile Association, Mumbai, recipient of V. Sivaramakrishna Iyer Memorial Gold Medal and also V.S.Subramaniya Aiyar Gold Medal. He rose to the post of head of QEI section on September 25, 1997, and subsequently succeeded as Director on August 19, 2000. He has excellent organizational skills and took up the upgradation programme of Blow- room machinery, as soon as he took over as the new director. Under his leadership CIRCOT is working on a new simple model micro spinning unit, in collaboration with TRYTEX, which is almost ready. Studies are under way. He organized a seminar on future prospects of knitting and knitwear in the month of June 2002. It was an instant success, and widely accepted and appreciated. Dr. Srinivasan was on the Editorial Board of the reputed textile magazine "Indian Journal of Fibre and Textile Research" for the period 2002 –2004. He is destined to play a very important role in the overall development of CIRCOT. We look forward many new ventures so that the Institute attains greater heights in the coming decade.

SPINNING MASTERS

Sri Rolf P. Richardson, F.T.I., The first spinning master! (1924-1936)



Sri R. P. Richardson was considered the first spinning master, who took charge of spinning section on November 3, 1924. Prior to his arrival, two persons assumed the office; Sri W. Briggs was appointed on March 1, 1924. Unfortunately, for health reasons he had to leave India shortly after assuming his position. The second person was Sri W. B. Walmsley, who took over temporarily up to November. Sri Turner and Sri Richardson laid the firm foundation of the spinning section with the latest machines available in the country. Technological Laboratory was considered as one of the best equipped laboratory conducting the technological research of cotton fibres in the world.

Sri Richardson started his career in the Clarence Mill, Staly Bridge in 1899, and three years later joined the Queen Mill at Dukinfield. He left the mill in 1912 to proceed to Canada to take service with the Dominion Textile Mills at Montreal, from where he returned a year later to become spinning master at the Galbraith mill, Glasgow, Scotland. In 1911, he was awarded the full technological certificate of the City and Guilds London Institute in cotton spinning and was appointed Demonstrator in cotton spinning at the Technical School at Oldham, for the session 1915-16. During the war period he served in Lancashire at the Newton Moore Spinning Co, Dukinfield as Ring, Winding and Beaming overlooker, until his arrival in India in march 1916. After five years of service with John and Co. at Agra, Sri Richardson was transferred to Tinnavelly Textiles at Kovilpatti in South India. His long and varied experience of nearly 25 years in textile manufacture was rewarded, when in 1924 he was appointed as the spinning master at the Technological Laboratory. In April 1927, he was admitted as an Associate of the Textile Institute, Manchester, and a 'Fellow' in 1930.

Sri Richardson initiated the spinning research programmes on Indian cottons at the Technological Institute practically from the very beginning. He served the directors of the Laboratory, first under Dr. A.J. Turner and later under Dr. Nazir Ahmed. He had gained his practical knowledge of cotton spinning in Lancashire itself and in Canada, Scotland and elsewhere. His vast experience of mill conditions in different centers at Agra, Bombay, South India and England proved valuable. His research work in Bombay during the twelve years was equally useful. While the Director was on leave, he officiated on a couple of occasions. Typically a Lancashire man, of a frank and sociable nature, he was exceedingly popular with all members of the staff in the laboratory and also in the spinning department in particular. Initially when he was on leave, Sri A. D. Walwyn used to act in his place (W

.H. Brady and Co. had lent his services). In later stages, Sri Dorab Kapadia, Technologist (he later resigned and went to V.J.T. Institute), Sri N.Iyengar, Spinning Assistant of Technological Laboratory looked after the work of the office. Sri Richardson was a prominent member of the Bombay European Textile association, where he used to take active part in cheerful and enlightening discussions at monthly Thursday meetings. He contributed many articles to the Indian Textile Journal. Among them, 'Mule Copping' and 'High drafting of cottons' are well read in India and abroad. After staying in England for some time upon retirement, he returned to India and served in one of the mills at Kanpur as Manager for a few years. He died in Bangalore on August 1950. The Technological laboratory was fortunate enough to be guided by such eminent spinning master as Sri Richardson in the early years of its development.

Sri V.V. Gupte, B. Sc. (Tech) (Manchester); (1936-1962)

Sri Gupte assumed office after Sri Richardson's departure. He worked as the spinning master of the technological laboratory from 1936 to 1962. He had just returned from England in August 1935 after completing the B. Sc. (Tech) in first class. Before going abroad, he had obtained his B. Sc. from Bombay university. He worked as a graduate apprentice at Messrs. Jubilee Mills, Ahmedabad for four years in spinning department. He was also an excellent sports person.

Textile science was it's infancy at the time Gupte took over as the head of the spinning section at technological laboratory. He conducted several studies on cotton spinning along with eminent directors like Dr. Nazir Ahmed, Sri Sen, Sri Harirao Navkal, Dr. Nanjundaiah, and Dr. R.L.N. Iyengar. He is mainly remembered for his outstanding contribution to developing the 'Micro spinning technique,' which is unique in evaluating the breeders' early experimental trials. It is immensely useful in conducting small scale spinning trials of various blends of different fibres. Presently, the system has been upgraded by providing necessary inputs. Cotton traders, private seed manufacturers, and the leading textile mills like Raymond's, Century, Morarji are making use of the facilities, which speaks for their usefulness and popularity! Sri Gupte worked for the development of 'Amber Charkha' and made certain improvements in its working.

During this period when the Indian Nationa movement wasat its zenith, the production of 'Khadi' fabrics was the talk of the day. Mahatma Gandhi promoted the movement in a big way, and Gupte's work received immense recognition. Gupte lent his services to All India Spinners' Association for three months beginning 21st March 1953. When Dr. R.L.N. Iyengar went on leave for one month, Gupte conducted the duties of the Director.

Gupte was one of the first Indian spinning masters who held a degree in textile technology in those days, when textile science was still in its embryonic stage. The small scale spinning system was first tried at Alexandria, Egypt and later a new model was devised and perfected at Shirley Institute, Manchester, during 1959-62. Sri Gupte found a very practical working model in 1950. We recognize his contributions by dedicating to improve the system still further in the coming years.

Sri R.P. Neogi, B. Sc. (Cal); B. Sc. (Tech); (1963-1972)

Sri Neogi joined Technological Laboratory on January 21, 1963 as S.S.O. The imported plats blow room machinery, and Indian cards were supplied to the technological laboratory in 1963-64 season. He erected the Plats Blowroom. Part of the ducting work and electrical panel work could not be completed during his tenure in 1970. Sri Neogi got an extension for two years and completed the work in the most efficient manner. Sri Jagjivan Ram, a minister in the Central Government, inaugurated the new Blowroom during the Golden jubilee celebration of the CTRL. Sri Neogi retired on June 1, 1972. During his earlier years, he had the experience of working in some textile mills in South India, including a mill at Kovilpatti as a Production Manager. He was recommended by none other than Frederic Stones for the post of SSO at the technological laboratory.

Sri. M.S. Parthasarathy, M.Text. (Bom); M. Sc. Tech. (Manchester), (1972-1995)

Sri Parthasarathy joined as Senior Scientific Officer at CTRL on 1972. Before coming to the Laboratory, he worked at SITRA, Coimbatore, as a research officer for 15 years. He joined CTRL (presently known as CIRCOT) as head of the mechanical processing division, worked for twenty three years, and retired as Principle Scientist. He was deputed by ICAR to UK under the Colombo plan between 1961-63 for advanced research in UMIST (Manchester) and had practical training in Platt Brothers, UK. He was a member of the CIRCOT delegation to UK, Belgium, and France in 1973 under the Indo-UK Collaborative Program in Natural Resources Research. He has published 100 research papers in National and International Research Journals. During his time, major modernization work was done in the Mechanical Processing Division.

Sri. Parthasarathy was the examiner in textile technologies at VJTI and Textile Engineering Institute, Ichalkaranji. He was also the member for Board of studies of textile technology of Mumbai and Shivaji University. He served as the secretary to Indian society for cotton improvement until recently and at present is a member. He retired as Principal Scientist and Head of MPD on April 31, 1995.

Sri B. Srinathan, M. Text.

Sri Srinathan obtained a B. Sc. (Text) degree from SKSJT institute, Bangalore, M.Text. from Bombay University in 1975. He was deputed to attend the special course in knitting technology, Leicester Polytechnic, U.K. Later he became the head of ginning and knitting section, CIRCOT, Mumbai. He worked over four years with BTRA, VJTI and served CTRL for twenty three years. While working at CTRL he erected many new machines such as L.R. Drawing, L.R. Speed frame, L.R. Ring frame, L.R. Lap former, comber OE (Rieter trainer model), and MMC cards and NMM ring frames. He visited USSR, and published 38 papers in Indian and foreign journals. He was responsible for establishing an excellent work culture and discipline. He had tremendous stamina and a flair for innovative work culture, and a childlike inquisitiveness to know and learn new things. During his time the spinning section was dynamic and vibrant. For the first time the section blended other fibres like jute, ramie, wool, silk, and banana with cotton. The new fabrics were displayed.

Sri T.N. Ramamurthy Rao, B. Sc.; B. Sc. (Tech); M. Tech.

In public interest, he was deputed from the Uttar Pradesh government holding the charge of senior class I officer's post of scientist (Fibre science) at C.S.W.RI, Avikanagar, in the revised pay scale of Rs.1100-1600 along with his permanent post to this lab with effect from December 5, 1975. He was in charge of Mechanical Processing division until his retirement. He retired from service on October 31, 1989, in the grade of Principal Scientist.

Dr. Anap, B. Tech.; M. Tech.; Ph. D.

Dr. Anap joined CIRCOT in 1984 as S-2 Scientist and transferred to GTC, Nagpur. He completed doctorate in 1997 and selection grade. In 1994, he was promoted to the rank of Senior Scientist. He transferred to CIRCOT, Mumbai on July 28, 1995 and was in charge of MPD for a few months. He took voluntary retirement on September 1, 1998.

Sri Muntazir Ahmed, B. Sc.; B. Text.

At the time of this publication, Sri Ahmed is holding the post of Principal Scientist/Head of M P Division. He was one among the first batch of ARS scientists and joined CTRL in the grade S-1 on December 29, 1976. He graduated from Agra University with honors. Before joining CTRL, he worked as shift–in-charge in a composite textile mill at Kanpur for three years, and later as an assistant cotton technologist in U.P State Govt. for 6 years, he simultaneously held the charge of Assistant Economic Botanist (Cotton). He also obtained a special certificate in knitting from De Mont Fort University, U.K. His area of work comprises of technical evaluation of naturally colored cottons, weft knitted structures and needle heating.

Among other things, he has published well over fifty scientific articles in reputed Textile Journals and has won many awards for his Hindi articles on knitting! He is a guest faculty member for various Mumbai Textile Institutes. He is also a resource person for various refresher courses, and workshops on modern weaving and knitting.

Some important events in CTRL/ CIRCOT

Source: 50 Years of Research- V. Sundaram

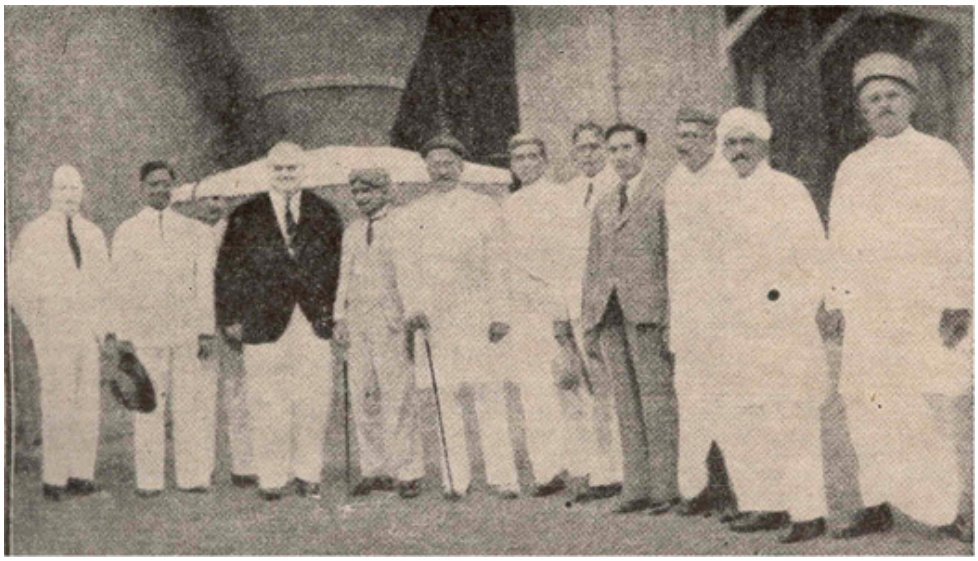
1	Jan	1924	Dr. A. J. Turner takes charge as Director.
2	Dec	1924	H.E. Viceroy, the Earl of Reading, formally opens the Spinning Laboratory and lays the foundation stone of the Research Lab.
3	Sept	1925	Normal working starts in the research laboratory.
4	Oct	1928	Sample of textiles recovered from the archaeological Excavations at Mohenjodaro arrive and are investigated.
5	Mar	1930	Dr. Nazir Ahmed takes charge as Assistant Director.
6	Dec	1930	Dr. A.J. Turner leaves for England on leave preparatory retirement; Dr. Nazir Ahmed succeeds as Director.
7		1931	Further specimens of fabric over an ancient relic from Mohenjodaro arrive, the fibres identified as cotton.
8		1932	ICCC fixes scales of fees for testing mill samples which do not have any technological significance.
9	Aug	1932	First training course for persons deputed by industry conducted.
10		1933	'Methods of tests on fibre, yarn and cloth' compiled and published By Sri D. L. Sen, revised and published in December 1948, in Technological Bulletin No.69, Series A, ICCC. This was further revised/updated in 1966-67 by Dr. RLN. Iyengar, and Dr. V. Sundaram. During 2002-03 yet another revised version was brought out by Dr. Srinivasan.
10	May	1935	Extensions to Blow-room by 30ft. and to Yarn testing section by 22ft. Completed. Also more land acquired for the laboratory by getting the adjacent plots. Shirley Analyzer purchased.
11		1937	Inauguration of the Testing House of the laboratory and The subsequent recognition by the Mill Owners' Association of Bombay and Ahmedabad.

12		1938	Laboratory was recognized as the official testing house for BISFA.
13		1940	CTRL is recognized as the official testing house for the mills in Bombay Province by the Indian Stores Department, of India. In the spinning division half of the machines were of the drafting systems of Slubber, Inter, Roving were converted from three roller to Casablanca drafting system.
14	April	1941	Ginning section was opened.
15		1942	Tests on AGMARK cotton sample started.
16	July	1952	Two shifts in spinning division started.
17	Nov	1954	Two and half-hour extra work per day for the spinning dept.
18		1957	Laboratory accommodation extended to the first floor of the Research Building.
19	Feb	1957	Staff Research Council was formed.
20		1958	Bombay University recognizes CTRL for postgraduate research in physics (Textiles).
21	Aug	1959	Scheme for commercial grading of cotton starts. Hon. Minister Sri Lalbahadur Shastry visited the lab. (January 15, 1959).
22		1961	CTRL participates in the Calibration program of USDA for Micronaire and Pressley Tests.
23	Mar	1964	New Block was opened by the President of ICCC, Sri A.D. Pandit.
24	June	1965	CTRL included for International Cotton Calibration program for micronaire arbitration by IFCATI, ACSA, and EICA.
25	April	1966	ICCC dissolved; CTRL comes under the administrative control of the ICAR.
26	April	1967	CTRL becomes one of the centers of work of All India Coordinated Research Project on Cotton. (AICCIP).
27		1967	Three buildings completed in Mahim for staff quarters.

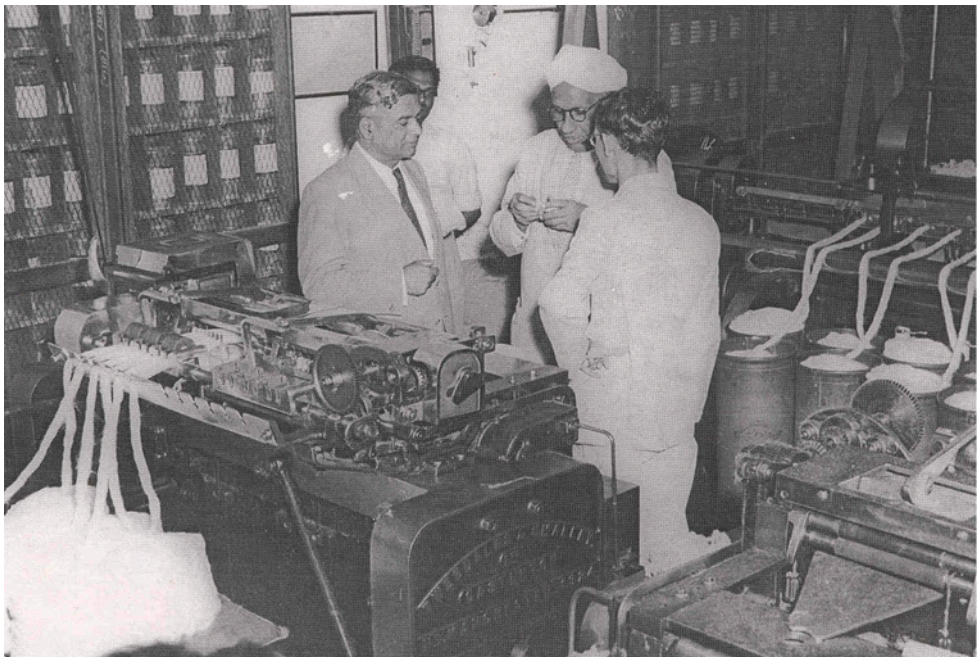
28		1970	Three N.M.M Ring Frames were erected in M.P.D.
29		1972	Four M.M.C. Cards were erected. In the F.T. Section Digital Fibrograph Model 230-A was received.
30	July	1973	Director and another staff member deputed to Sri Lanka for setting up a Cotton Technological Laboratory under Asian Development Bank. L.R. Drawing Model Do/2 Installed in M.P.D.
31	Jan	1974	The Line Shaft of M.P.D was dismantled and all the machines were given individual drives. Some old (Obsolete) Ring frames were discarded.
32	Dec	1974	Golden Jubilee was celebrated. The new PLATTS Blow-Room was inaugurated.
33		1976	Digital Fibrograph Model 430 received.
34		1976	L. R. Speed Frame, Model GS, L.R. Ring Frame Model DJ5 installed.
35		1978	L.R. Sliver Lap Machine E2/4a, L.R. Comber E7/4 Installed.
36		1978	P.S. Metler High Speed Cone/Cheese Winder model.
37		1979	Open End Trainer Model installed.
38		1978	Fibrograph Model 430 Installed at F.T. Section.
39		1981	Sliver Trash Analyzer. (SDL)
40		1982	Doubler Winder. (Textool)
41		1983	TAIRO Model Miniature Cdg, Drg, Roving, Uni Spinner.
42		1984	Fibrograph Model 530 (In FT).
43		1985	Cotton Colorimeter Model 830.

44		1986	Uster Classimat II, Ring Doubler Twister.
45		1987	900 High Volume fibre tester. (In F.T) Knitting Machine.
46		1988	Tenso Rapid Model No. 6159 WE (In Y.T).
47		1988	Bentely ' Komet ' Sock knitting machine.; WMB 4 TD Interlock machine; Camber 'Cheminit' Knitting machine (Single jersey)
48		1990-91	Trash tester.
49		1993-94	Kawabata Fabric Testing Instrument.
50		1994-95	Digital Fibrograph. Model 630.State separator. (In FT)
51		1996-97	KES- FB4 (Surface tester).(KES-FB-1-4) Data processor.
52		1997-98	Upgrading of SKF. PK .225 Ring frame drafting system SKF PK –1400-60. Speed frame drafting systems. Small diameter circular knitting machine Ring spindle centering device. Ring spindle-lubricating machine Inverter drives for Speed frame, Micro Drawing, Fly frame, Carding, and Ring frames. Uster HVI 900 Fibre quality evaluation section Uster AFIS Fibre quality evaluation section Kawabata fibre bending testing machine. KES - FB2 (Bending tester) Installing of new Speed frame and a Ring frame (both Textool) R&D work is still in progress.

Distinguished Visitors to Cotton Technological Research Laboratory

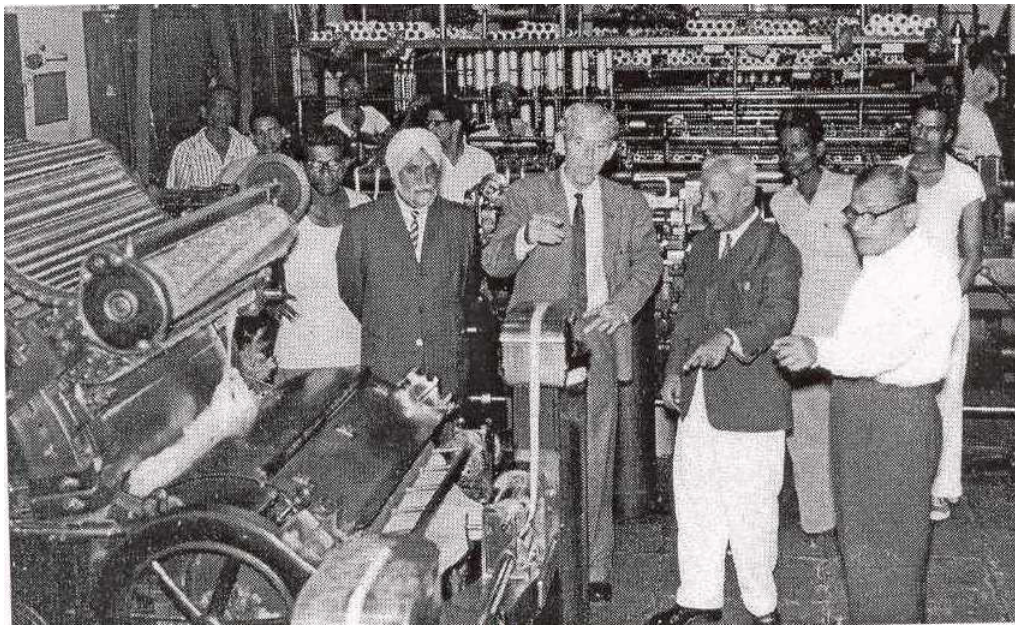


Spinning Section in 1934 under the directorship of Dr. Nazir Ahmed



Professor C.V. Raman's visit to the Technological Laboratory (mid fifties)

The Hon. Minister Sri Lal Bahadur Shastry's visit, January 15, 1959. Dr. RLN Iyengar and Dr. B.L.Sethi, Secretary, ICCC are also in the photo



Dr. RLN Iyengar and Sri R.P. Neogi showing the working of Cards to the visitors in the spinning section (1965)

Research publications by the Technological Laboratory

A-4	1927	The effect of temperature and humidity on cotton spinning with particular reference to the conditions in Bombay.
A-7	1928	The effect of different spindle speeds on the results of Spinning tests.
B-1	1928	The foundation of yarn strength and yarn extension. Part I- The general problem. Part II The relation of yarn strength to fibre strength.
B-3	1928	A note on the early history of cotton.
A-11	1929	The effect of using either one head or two heads of drawing instead of three heads of drawing in the spinning preparation for spinning tests.
A 15	1930	Preliminary spinning tests on mixings of American and Indian cottons using ordinary and high drafts.
B-6	1930	Studies in sampling of cotton for the determination of fibre properties: Parts I& II.
B-8	1930	The foundation of yarn strength and yarn extension: Part III – The clinging power of cotton.
B-9	1930	The foundation of yarn- strength and yarn- extension: Part IV – The influence of Yarn-twist on the diameters of cotton yarns and on the proportion of fibre-slippage- and fibre-fracture in yarn-breakage.
B-12	1930	A study of comparative results for lea, single thread, and ballistic tests on yarn spun from Standard Indian Cottons.
L-1	1932	Note on the harmful effects of adulterating good quality Indian Cottons.
A-23	1933	Variation in the moisture content of baled Indian cotton with atmospheric humidity.
B-17	1933	The foundations of yarn-strength and yarn-extension: Part V –The prediction of the spinning value of a cotton from its fibre properties.
A-27	1935	Combing of good quality Indian cottons.
B-21	1936	A new method and apparatus for determining the average length and fineness of cotton hairs.

A-42	1938	Empirical relationships between count, Lea strength and staple length of Indian cottons.
A-48	1939	Empirical relationships between count, twist and strength of cotton Yarns part I & II.
B-26	1939	A dial reading apparatus for determination of fibre strength.
B-29	1941	The chemical processing of Indian cotton materials: Part I.
A-59	1944	Spinning tests on mixture of staple fibres with Indian cottons.
L-6	1944	Variation of fibre-length in a bulk sample of the cotton and in a single seed of the bulk.
B-34	1945	The analysis, grading and utilization of Indian linters.
B-36	1947	The estimation of waxes content and feel of a cotton from its physical character.
A-69	1948	Methods of tests on fibre, yarn and cloth at the technological lab.
B-40	1949	Determination of the maturity coefficient of Indian cottons.
B-43	1949	Causes of neps in Indian cotton yarns.
B-45	1950	"Spinning tests on Micro-samples of cotton.
A-77	1951	A consolidated report on the pre-cleaning and ginning tests.
A-80	1952	Effect of twist on yarn strength with special reference to the estimation of the latter at different twist multipliers.
B-48	1953	Staple length of cotton.
A-88	1955	An explanatory note on the highest standard warp count.
B-52	1955	A balance for the rapid determination of the ginning percentage of seed cotton.

L-38	1955	Advantages of replacing the Bush- bearings of single roller McCarthy gin with Ball bearings in regard to power consumption.
B-53	1956	Development of a suitable technique for the determination of halo-length of cotton.
L-39	1956	Laboratory gin and its performance.
L-40	1956	A study of the effects of converting the double to single action in a single roller gin.
A-93	1957	Reports on the experiments carried out on Amber Charkha, at the laboratory.
A-94	1957	Effects of storage of baled Indian cottons at Bombay and at their respective growth Centers on the lint quality.
B-56	1957	A review of the studies of the relationship between the spinning value and the chief fibre properties of a cotton.
B-60	1958	Degradation of cotton during mechanical processing.
B-69	1959	Economic and technical survey of existing gins in India.
B-72	1959	The skein strength of yarn in the metric system.
B-76	1960	Moisture regain of raw cotton, cotton yarn and cotton fabrics at 65% R.H. and 80oF.
L-60	1960	The application of X-ray diffraction method for the evaluation of fibre quality.
A-106	1960	Studies on the mixing of Indian cottons with special reference to their fibre properties.
B-77	1960	A study of the relationship of yarn irregularity with fibre properties and its effect on the yarn strength.
B-81	1960	Oil and linter contents of Indian cottonseeds.
B-85	1962	Studies on the effect of conditions of growth on the strength and structure of cotton fibres, Part I.
L-71	1962	A note on the relationship between fibre properties and spinning value of cottons of Staple 1-1/16" and above.

A-109	1963	Upgrading Indian cottons of good quality by the use of double roving on double apron drafting system.
B-86	1963	Structural properties of cotton fibres, Part-II-Birefringence and structural reversals in relation to mechanical properties.
L-74	1963	Comparative performance of three inter specific varieties of cotton.

Textile Journals available in the CIRCOT Library

Name of the Journals		**Remarks** **M: Monthly; Y: Annual; W: Weekly; Q: Quarterly; BM: Bi-monthly**
African textiles		Managing editor: Zsa Tebbit, Allan charles publishing co., London.
Textile Journal of Australia Est. 1926.		Mng.editor: Ada D. Mardel, 19-47 Jeffcott street, Melbourne, Australia.
America's Textiles (ATI) Est. 1887	M	Cotton magazine established in 1898, from Atlanta USA. Copies are available from 1929. During 1938, the name was changed to cotton serving the textile industry. Further Change took place as Textile industries in 1947. It was called America's Textiles, published from M/s Billian publishing co; Atlanta, Ga. America's Textiles International Knitting /Apparel in April 1986. During the same year in December, it became ATI, the logo and the get up changed very rapidly.
Asian Agri-history Est. 1994.		Editor in chief R.L. Paliwal To facilitate dissemination of major on agriculture to research on suitable Agr in the south and south east Asia region. Asian Agri Foundation, 47, ICRISAT, colony 1, Brig. Sayeed road, Secunderabad.

Apparel		Official journal of the (M.A). The clothing manufacturers' Association of India. Mng. Editor: Rajesh Bhagat. Finesse Infomedia, 309, Parvati Industrial premises, Sun mill compound, Lower Parel (W), Mumbai- 400 013.
Apparel online world wide	F	Editor in chief: Dipak Mohindra, Publication: Contact communications, B-32, South extension, part –1, New delhi-110 049.
Bombay cotton annual / Indian cotton annual. (1919-20)/ (1968-1969)	Y	Very useful compendium of all matters relating to every branch of the Indian cotton trade, containing exhaustive information and statistical tables relating to crops, exports, imports, prices, stocks, Government notifications etc; production, distribution and cases of Indian and foreign cottons, yarn and cloth. Published by EICA, Cotton exchange, 175, Kalbadevi Rd, Mumbai-400 002. (From 1919-20 to this date)
Cotton statistics and News	W	Editor and publisher: Sri S.M. Joshi, cotton exchange building, cotton green, Mumbai- 400 033.
The cotton gin and oil mill Press	M	January 11, 1969, This is the magazine of the cotton ginning and oilseed processing Industries. Editor: Don Swanson, Published by Haughton publishing co; Texas.
Empire Cotton Growing Review	Q	Started in January 1924, First editor, J.C.Willis, M.A, ;Sc.D; F.R.S; In 1967, the term 'Empire "dropped. In October 1975 a valedic-tion. The last copy. More than half a century of work comes to an end.
Express Textiles	W	Indian express. Deals with the latest news of the textile industry. Government regulations, latest happenings around Mumbai.
The Indian Textile Journal	M	Started in 1890. The first copy available from January 1909. The oldest Indian textile journal. The editor: S.M. Rutnagar (late)

Indian cotton growing review	Q	Started in 1947, it was the journal of ICCC. Sir Roger Thomas started to disseminate useful information on cotton breeding. This was stopped once the ICAR took over in 1966. ICCC carried out more than 300 research projects around the country. By 1966, nearly 70 varieties were released.
Indian Textile Monitor, now International Textile Monitor. (ITM)		Copies are available from 1995-96. Editor Sri Madan Gaur. Now Savita gaur. Starword Publication, 15, Metro house, 2nd floor, S.B.S.Rd, Colaba, Mumbai-39.
Indian Journal of Textile Research	Q	Vol.1. No.1 March 1976. Chief editor: L.Y.R. Chedha. Published by CSIR, The name of the journal was changed to Indian journal of fibre and Textile Research with effect from march 1990. Editor: S.K.Rastogi.
International Textile Bulletin (Available from1930-1962)	Q	Published by the International federation of Master cotton spinners' and manufacturers' association, Manchester. Editor; N.S.Arno Pearse, General Secretary. From 1955, the name of the magazine was changed to International review of cotton and allied textile industry. Editor: M.Ludwig LL.M.
ITB (ITS Publishing world wide)	6,Is.	Available from 1969. Editor-in-ch. Jurg Rupp, ITS Publishing CH-8952, Schlieren- Zurich, Swiitzerland, (German, English, French, Italian, Spanish).
Journal of the Textile Institute		Lord Rotherham of Broughton of Manchester , 46 A, Market street. Founded in September 11, 1907. Sri J.H.L Ester and Sri George Moores of Manchester discussed the work of the International Association for testing materials in the Brussels Convention. Manchester. Textile Institute inaugurated on Friday April 22, 1910, followed by reception and Banquet in Midland hotel. The first journal was on January 1922. Editor in charge :Ian Home. Publication of research and innovation in textile subject. Science, Engineering, Marketing, Management as applied to the sale testing and use of fibres, yarn, clothing.

Knitting Technique.	M	Technical journal for the leather and knitwear fashion industries including fashion trends. Twin publication of Wirkerei- und. Strickerei- Technik. .Meisenbach Bambers. The name was changed in January 1995 as "Knitting technology," Publication of knitwear and Hosiery, Germany.
Platt's Bulletin (Bound vols)		From 1934 to 1973 published by Platts machinery works. UK.
Review of Textile Progress		Vol 1, 1949. The last was in 1966-67. The modern trend and the developments in the progress of various facets of textile industry. Starting from fibre, fabric and processing techniques. The testing methods. The name index and subject index. This was discontinued. Quarterly journal of JTI, March 1969, vol 1, no.1
Shirley Link (1966-71)		From 1966-71 published from Shirley Institute. From 1972 on wards, it was taken over by the Textile Institute, Manchester and is being published as 'Textiles'.
Shirley Institute Memoirs		From 1922 to 1970. The official journal of Shirley Institute. The basic research carried out at the institute and also at various BCGA's situated around the British sponsored research projects, their analysis and laboratory experiments are carried out and published. The journal was stopped. The others being 'Shirley Link' and 'Textiles'.
Textile Industry and trade journal	BM	Editor: R.C.Pandit, 112-A, Oshivara Industrial center, Ist floor, link road, Goregaon,(W) Mumbai-400 104.
Textile History		No. 1, Dec 1968. One devoted for textile history, supported by the Pasold Research Foundation. It is published even to this day.
Textile Asia	M	First bound book in Jan 1979. The regional textile and apparel monthly. Editor: Keyser sung. GPO Box 185, Hong Kong.
Textile Recorder		Established in 1883. Its name was changed to Textile Month in 1968.

Textile Digest.	Q	The magazine published by the textile Association After March 1972 it was changed to Journal of Textile Association. G.N. Vidya, M.A;.LL.M; was the editor. P.N.Ullal L.T.M, .A.T.I; was the publisher.
Textile Institute and Industry		Textile Institute used to publish three volumes, Under the banner JTI, namely, Index, transaction, proceedings. Index and proceedings were stopped and a new magazine. Started in 1st January 1963, last copy was in 1984. During 1981, a new magazine entitled 'Horizon' started.
Textile horizon		From September 1981. Later changed to 'Textiles' Journal. This is published by Textile Institute, Manchester.
Textile Month (TM)	M	The immediate successor of Textile Recorder published from Manchester from 1968.The logo was changed to impress the international clients, keeping in view of most modern innovations available in the market. New design concept was introduced. Started from April 1999.Managing editor; Adrian Wilson, Bradford, West Yorkshire.
Textile Manufacturer.	M	Established in 1875. The oldest magazine from the United Kingdom. Copies are available from January 1921 From January 1961, it was face- lifted. The last copy printed in 1975. Later in 1988, the name was changed to 'Textile manufacture and knitting world'. Independent and international journal of the Hosiery and Knitwear industry since 1929. William Thomas Commott was the founder of the magazine. A copy of golden jubilee celebration was brought out on 1925.
Textile Progress		Monograph series since 1969. Provided critical and comprehensive examinations of the origination and application of developments in the international fibre, textiles, and apparel industry and in its products. Editor in chief: David R Buchanan, N.Carolina state university USA. It is a Textile institute publication, Manchester, UK.
Textile Research Journal		First started as TRI Bulletin from Boston in February 1931. From January 1945 the name changed to Textile research journal (TRJ) A prestigious journal of International repute.
Textile Trend	M	Vol. V No.10, January 1963, Eastland publication pvt. ltd; 44, Chittaranjan avenue, Calcutta 12. Widest circulated on textile and allied industries. Editor: Malay Chakrabarti.

Textile Digest	Qtl	Journal of Textile Association from 1940. From October 1983 changed to JTA.
Textile Weekly (Started in early 1920s.)	W	This is the official organ of the National federation of textile works managers' association. First issue available in the lab is from march 1928. from march 1969 the name changed to 'Textile News.' The last copy was in 1970. The magazine was closed.
Textile world	M	Established in 1868. One of the oldest textile Journals in USA. We have the copies from April 1, 1922. The first journal was published on Aug 1, 1868 known as 'Industrial American' contained only 8 pages, with the size of 9/1/4x12. It was in 1969 February, changed as 'Manufacturers' Record & Industrial American'. In May changed as Manufacturers' Review and Industrial Record. In 1897, the magazine was purchased and consolidated with Textile World. In 1903 book merged with Textile World to form Textile World Record. During 1915, it merged with Textile manufacturers journal to form "Textile world." In 1932, June, TW shifted from a weekly to a monthly. To-day it is America leading textile magazine catering to the textile industry.
Textile Mercury and Argus	W/ Ftly	Started in 1889. The founding editor was Mr. Richard Mursden later in 1931 the absorption of another magazine Textile Argus of Bedford and the name changed to Textile mercury and Argus. During 1963, it was renamed as Textile Mercury International. Diamond Jubilee year was celebrated in 1939. The magazine was closed in 1966, after 77 years of existence. It was the 3956th edition.
The Textile Magazine	M	Editor: R. Kalidasan, Messrs. Gopali and co; .R.Complex, 407/408, Anna salai, Channai- 600 035
World textile Abstracts	M	Comprehensive coverage of the current textiles literature it brings together the scientific, trade, patent and economic issues in a single comprehensive source. It is the only source of the British, European and American patent and International Standards information in its field.

Shirley Institute/British Textile Technology Group (BTTG), 1988
Now BTTG Ltd. since April 2003

In 1916, the department of science and industrial research approached some prominent cotton manufacturers to encourage research in the field of cotton technology which was the means of employment to lakhs of workers engaged in the trade. The need to conduct research in the field of textiles was very great indeed. On December 7, 1916 a provisional committee was constituted. The prominent members of the group were J.W. McConnel, Kenneth Lee, W.L. Balls, J. Maxwell Garnet and H.P. Greg and representatives of many organizations. In two years time, BCIRA was formed.

The Council consisted of 32 members comprising representatives from various manufacturing associations:

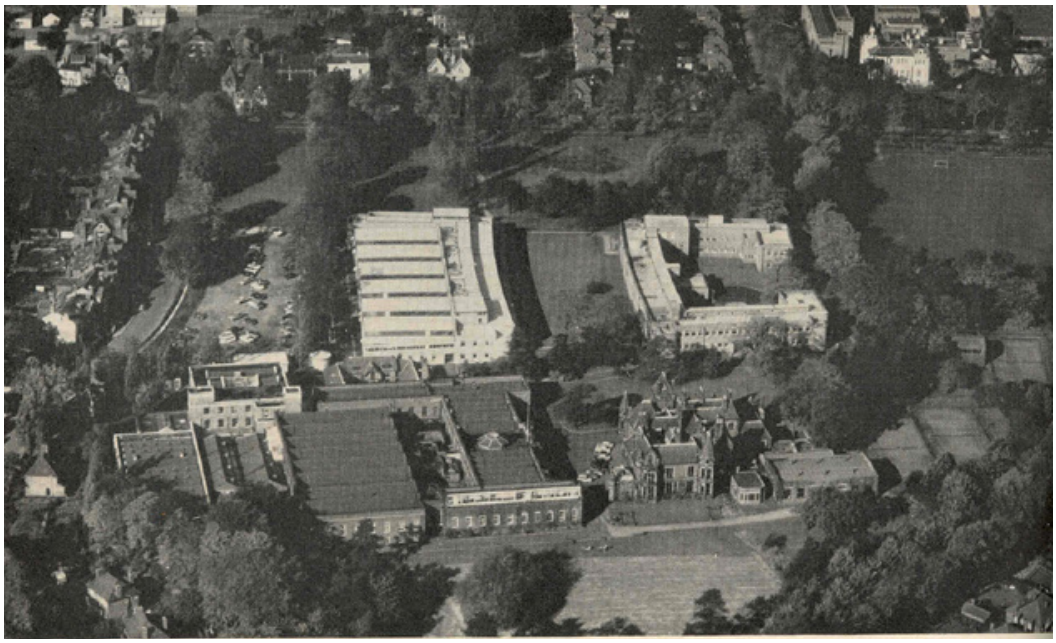
Cotton Spinners' Association Ltd.	Calico Printers' Association Ltd.
British Cotton and Wool Dyeing Association Ltd.	The Turners' Association Ltd.
Bleachers' Association Ltd.	Federation of Master Cotton Spinners' Association
Cotton Spinners and Manufacturers' Association	Federation of Calico Printers
Federation of Dyers and Printers	Cardroom Workers' Amalgamation
Operative Spinners' Amalgamation	Weavers' Amalgamation
Operative Bleachers' Amalgamation	Dyers and Finisher's Amalgamation

Cooperative research

Membership was open to British corporations and firms engaged in any of the branches of cotton industry and the corporation. Many felt that the desired results would only come forth when the chemist, the colloidal chemist, the physicist, the botanist, the technologist, and the engineer were

brought together under one roof, not as individuals each researching for a solution to a specific problem in his or her own field but as a body of workers co-operating under the guidance of one director. The provisional committee recommended among other things the area required for this endeavor. It could not be less than 5 acres, but could be up to 10 acres or more. It was to be located in a pleasant and calm surrounding, free from vibration due to traffic, and easily accessible both from the university and from the centers of industry.

As per the recommendations of the committee, a house and estate of about 14.5 acres known as *'The Towers'* was acquired. The Towers in Didsbury, connected with the history of Manchester, were

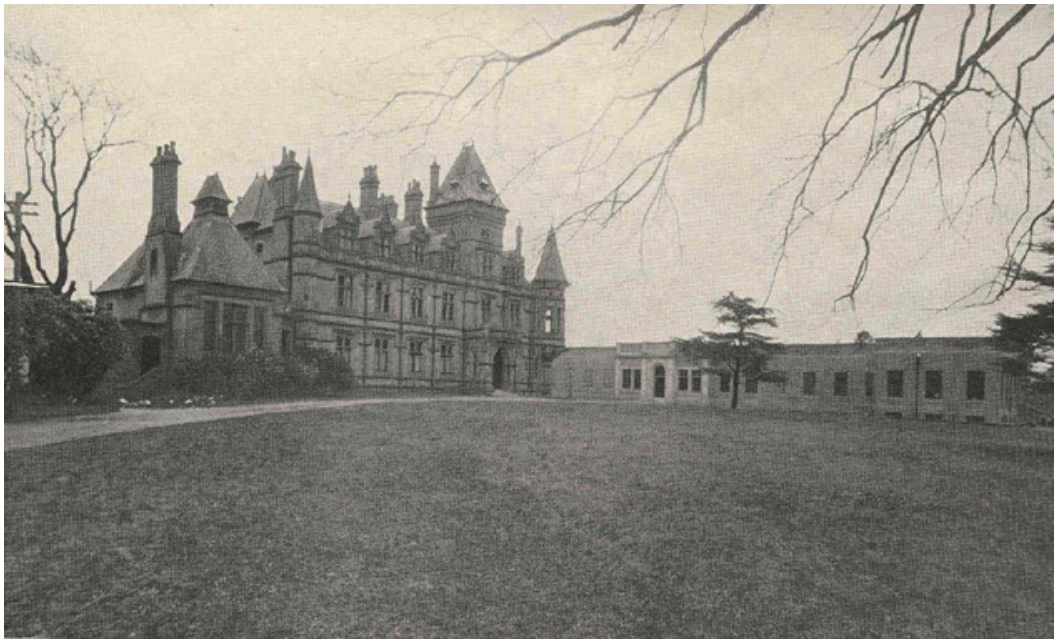


built in 1865 for the late Sri. John Edward Taylor, a former proprietor of the ' Manchester Guardian' in 1874, and passed into the possession of the late Mr.Daniel Adamson. It was now transferred into the library and council chamber. A decision was made to embark on the construction of the Manchester canal on June 27th 1882. One hundred years before, one of the famous Bronte sisters, Charlotte wrote a novel entitled 'Shirley', and the central character became the favorite fictional heroine of a certain William Greenwood, cotton spinner and member of parliament.

Greenwood named his own daughter 'Shirley' and in 1920, when he acquired the Victorian Gothic mansion, known as the 'Towers' Didsbury, he sold it at a price ten times less than the purchase price to the newly formed BCIRA. Thus the association received the house and an estate of about 14.5 acres on May 1, 1920. He wanted the institute named *The Shirley Institute* and so it was. Arrangements of the house to serve as a central administrative block began in July 1920 and finished in January 1921. The prevailing shortage of dwellings was met by the erection of 9 houses on the edge of the estate for married members of the staff and the conversion of several rooms in the institute into bedrooms for

men. The kitchen equipment was also extended so that members of the scientific and administrative staff could be supplied with lunch and tea in the institute.

The Research Laboratories of the institute were formally opened by his royal highness the Duke of York, K.G. on Tuesday, March 28th, 1922. Sri. Kenneth Lee was the chairman of the function. The



first issue of the journal "Shirley Institute Memoirs" was brought out in 1922. The journal was the link between the colonial and basic research work done at the Shirley Institute and the coordination of activities at various cotton growing centers. The last issue was published in 1975.

BTTG formed in 1988 when Britain's two largest independent textile research organizations, the Shirley Institute (1919) and WIRA (1918), joined forces. In 1961, BCIRA and BRRA amalgamated with the Shirley Institute and the name changed to Cotton, Silk and Man-made Fibres Research Association. The Shirley Institute retained its title due to the prestige it had acquired in the Scientific and Textile world. Today it is called UKAS, a premier independent accredited testing, investigation, consultancy and CE Marking laboratory. BTTG Ltd. (est. in April 2003) is a wholly owned private subsidiary of BTTG, founded in 1988.

Some notable achievements of BTTG are that two of her scientists, Dr. A.J.P. Martin and Dr. R.L.M. Synge, invented partition chromatography, one of the most powerful analytical techniques ever developed for separating and identifying the components of complex mixtures. They won the Nobel Prize in 1952 for their outstanding work in chemistry. During 80 years of dedicated service, BTTG had several notable achievements.

1. First breathable fabric.
2. Origin of Tog

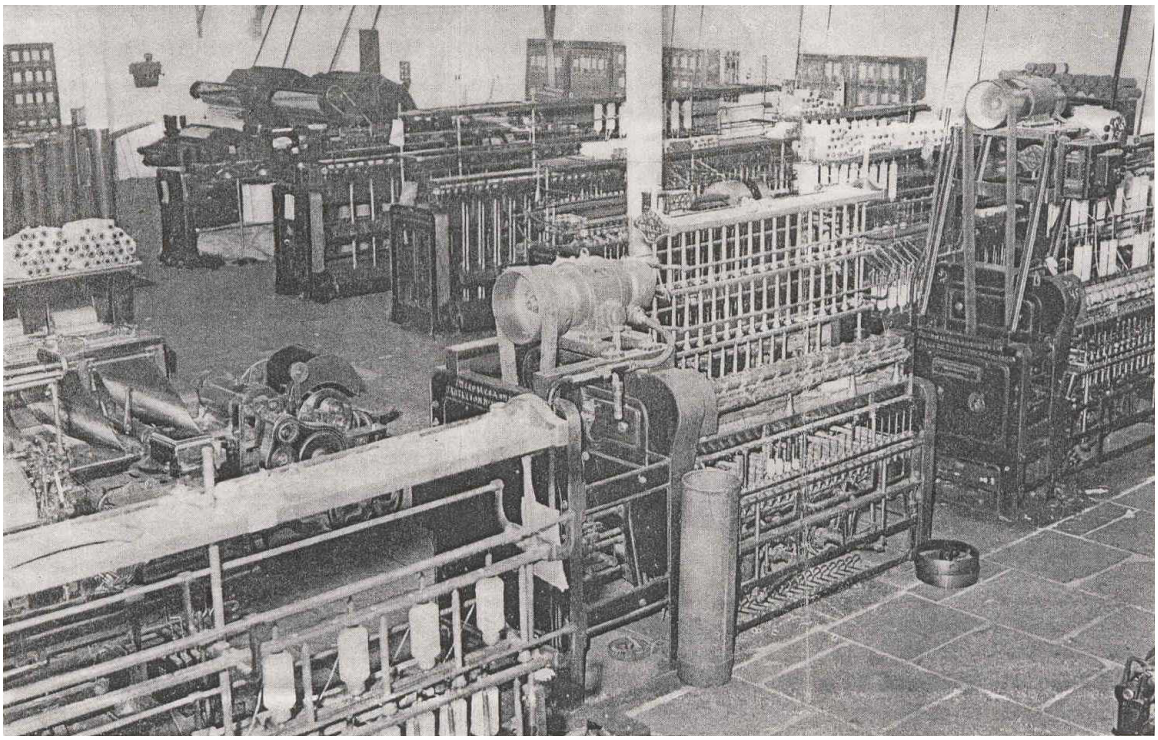
3. World's first shrink resistant treatment.
4. Abrasion testing machine for testing wear properties of fabric.
5. The services to a wide range of manufacturers and end uses, in all areas such as apparel and technical textiles, upholstery, soft furnishings, floor covers, construction products etc.

The areas of testing include: Flammability, Electrostatics, Clean room comfort, Microscopy, Microbiological Geosynthetics, Analytical chemistry, Optical blood, UV protection, Ecological, SEM Viral and bacterial penetration testing.

BTTG's staff represents over 50 nations and international standards committees including CEN and ISO. It is the only testing house accredited to test to the European Oeko-Tex standard 100 (Textile eco - labeling scheme), and is one of the only 6 laboratories with accreditation status for opinions and interpretations on test results.

BTTG, Ltd. also holds notified body status from the Europe's common authority to issue EC type examination certificates according to European directive 89/686/EEC. They have recently been notified against the construction products directive. BTTG offers number of training courses available on diverse range of subjects and would be of interest to a wide range of different industries.

Shirley institute Memoirs, 1922 Golden Jubilee Celebration (1904- 1954) on 1954.



Mechanical Processing Division
Spinning Section 1960

Some Leading Cotton Breeding Scientists

William Lawrence Balls, C.M.G; C.B.E; F.R.S; ScD; D. Sc.(Hons), F.T.I(Hon);

'Father of cotton Technology' (1882-1960)


DR. W. LAWRENCE BALLS

William Lawrence Balls is regarded as a unique person among many botanists, and is widely quoted in the field of cotton plant breeding even to this date! Lawrence Balls can aptly be termed the '*Father of Cotton Technology'* in that aspect of it which integrates our knowledge of cotton as a botanical product with its subsequent behavior in the spinning process. His research work on improvement of cotton quality in Egypt was recorded in golden letters. He explored the possibilities of relating the fibre properties of cotton in spinning to certain counts. While working in Egypt, he conducted several spinning tests with the help of Hancock. These ideas were translated to manufacture the '*Shirley Miniature Spinning Machines'* later at the Shirley Institute (with the help of Underwood and others). Beginning in Egypt as a young man of 22, he was known to work with 'one acre, one tent and one lab boy.' He had remarkable originality and powerful and versatile intelligence. He began as a botanist, but such was the quality of his mind that he successfully traversed the fields of agriculture, soil science, crop physiology, genetics, statistics, physics, and textile engineering! No botanist ever before has achieved mastery over a wide range of disciplines.

Working entirely alone, he published numerous papers on genetics and physiology of the cotton plant and a general account of his research in *The Cotton Plant in Egypt.* Published in 1912, this book is now regarded as one of the classics of applied botany and attracted wide attention on account of its novel approach to the cotton plant in many aspects. The analysis of the factors leading to the rapid breakdown of new varieties of Egyptian cotton is a case in point. He showed that pure lines of great merit could be extracted from the commercial crop and that these had vast possibilities for the stabilization of both yield and quality. Once a pure line was established, breakdown could not occur

if protected from natural crossing, and this led him to organize a system of pure seed supply, which served as a model for the whole cotton growing world!

His second book, *The Development and Properties of Raw Cotton,* published in 1915, dealt with his later research in Egypt and had the same stimulating quality and freshness of approach that characterized his first book. His third book*, Studies of Quality in Cotton* (1928), followed up on the ideas of the previous book, and gave an account of the work done under his direction at Bollington. Like its predecessors, this book has been a constant source of inspiration to cotton workers everywhere. Lawrence Balls wrote the introduction for an article entitled *"Design for quick production of spinning tests,"* authored by Frank Dunkerley, in 1950. He discussed various aspects of the machinery needed to be developed in achieving his objective. In 1953, he published his fourth book, *The Yields of a Crop.* He also communicated to the royal society several papers on the structure of the cotton fibre and his studies on the analysis of agricultural yield, with special reference to Egyptian cottons. He was elected a *Fellow of the royal society* in 1923.

Lawrence Balls was a man of great personal charm. Widely read, he conversed with great erudition on a vast range of topics. Iconoclast as he sometimes was, he could not avoid controversy, but in both writing and speech, he criticized dispassionately and unemotionally. To young workers everywhere he was kindness itself, and his great gifts were always at their disposal.

In Bollington, he built a unique team of research workers comprising all grades from laboratory assistants to graduates. All were made to feel that they played a vital part in the research work and that whatever they did was important. As an '*inventor,*' he ranked high! '*The balls cotton sorter'* and the device for the mechanical computation of standard deviations were ingenious and useful.

Balls was born on September 3rd 1882, being the son of William Balls, a schoolmaster of Diss, Norfolk, and was educated at King Edward VIth School, Norwich, and St. John's College, Cambridge. He became a fellow of his college and on his retirement to Fulbourne, near Cambridge, he was elected on honorary fellow in 1955. From 1904 to 1910, he was a botanist for the Khedivial Agricultural society, and he held an appointment in the Egyptian. Department of Agriculture from 1911 to 1913, and again from 1927 to 1933. From 1915 to 1926, he was the first head of the experimental department of the *Fine spinners and doublers LTD* at *Bollington.* He returned to Egypt in 1934, as cotton technologist to the ministry of agriculture and chairman of cotton research board. During his period of service in England, he served on two important committees: *The provisional committee for research in the cotton industry* (1916), and *The board of trades, empire cotton committee* (1917).

During the first world war, he presided over the scientific committee, which advised the Commander in Chief, G.H.Q Middle East. He retired in 1947. He was intimately connected with the Textile Institute from the very beginning and became a member in 1916. He was awarded the honorary *fellowship* in 1942, in recognition of his major advances in textile technology by an individual as the result of ingenuity and application over many years. This is the highest honor bestowed by the Textile

Institute. He received the award for his pioneering work on the application of botanical research to the cotton plant and fibres. Dr. Balls, Mr. J.H. Lester and Mr. A. Abbott laid the foundation for cotton research at the Shirley Institute in an extraordinary manner, and Lancashire could never be sufficiently thankful to these three men for preparing such a valuable base for cotton research.

In 1931, he was invited to deliver the *Mather* lecture and chose as his subject *"Current changes in technology of cotton spinning and cultivation,"* a well prepared paper comprising all the aspects of cotton development work which he pursued at Egypt all those years, including special studies on spinning. Consisting of half a dozen pages, the paper was eminently presented by his beloved assistant, Mr. Hancock. He contributed an article to the journal of textile institute in 1916, and many outstanding contributions followed in the subsequent years. The last paper published in the Journal of the Textile Institute was in August 1960. Unfortunately, he was not alive to see this publication! Dr. Turner published his first article entitled " Spinning Value of Cotton " in the journal Empire Cotton Growing Review in 1924, soon after he assumed office as Director of Technological Laboratory of ICCC, Bombay. He listed Dr. Ball's work in the reference column. Other notable published articles are *Handbook of Cotton Spinning Tests*, Published by Macmillan and Co. and *A method for measuring the length of cotton hairs*, Fine Spinners' Industrial HandBook, 1920.

Dr. Balls passed away on July 18, 1960, at the age of 77. He was invited by the then Indian central cotton committee, Bombay, to give advice regarding the proposed introduction of Egyptian cottons in the areas of Punjab, Sind, Madras and Mysore. Some local experts were sent to Brazil, Peru and Mexico to collect the new breeding material. Unfortunately, with the exception of Madras, the other two places could not produce cotton in the required parameters.

Dr. Balls, while summarizing all the aspects of cotton breeding over many decades of work in Egypt said, "The cotton is grown to be spun. If cotton spins well, obviously it is good, otherwise it is not!"

Dr. Balls has inspired hundred and thousands of botanists around the world and his work is gifted as the beacon for the present generation of scientists as well!

Sir George Watt (1851-1900)

Sir Geogge Watt was a British botanist who stayed in India for many years. In 1907 he wrote the book *Wild and Cultivated Cotton Plants of the World*, which is an authentic guide to cotton breeder scientists around the world. Somewhat earlier in 1893, he authored the wellknown book *Dictionary of Economic Products of India*. This monograph on cotton is an unusual storehouse of historical and botanical information.

Sir Joseph Burtt Hutchinson, CMG; Sc. D.; FRS

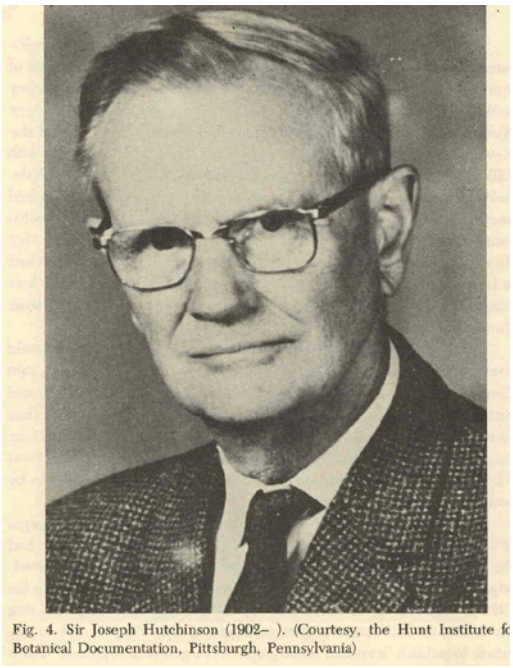


Fig. 4. Sir Joseph Hutchinson (1902–). (Courtesy, the Hunt Institute fo Botanical Documentation, Pittsburgh, Pennsylvania)

Sir Hutchinson was born in Burton Latimer in Northamptonshire in 1902 and educated at Acworth and Boothasn schools and St Super technology Pvt. Ltd., John's college, Cambridge. He joined the ECG Association in 1926. After obtaining an honors degree in botany at Cambridge, he went on to the directorate of the cotton research station in Trinidad as a post graduate candidate and worked for seven years. He later came to the Institute of Plant Breeding Industry, Indore and worked as a geneticist and botanist. He went back to Trinidad in 1937 and worked as the Head of the Genetics Section and as advisor to the inspector general of agriculture at West Indies. In 1944, the Trinidad Institute was closed. He went to the Shambat Station of Sudan after Mr. Parnell's retirement in 1949. He succeeded him as director at Namulonge. Visited Nigeria with E.O. Pearson in 1947 and expanded the cotton crop there. He traveled to the American cotton belt and gave lectures at the department of Genetics at North Carolina State College. He retired on September 15, 1957. He was the member of the agricultural research station of Sudan, and technical adviser to Uganda. He was awarded the CMG for his outstanding contribution rendered at West Indies in 1944 and a ScD at Cambridge in 1949. He was

also elected as the Fellow of the Royal Society in 1951. Later in 1956, he was knighted.

He was appointed as chair of agriculture at Cambridge; he was elated to be a fellow at his old college. As a practical agriculturist, he conducted all field experiments personally at Namulong.

In addition to numerous research papers, he and his colleagues published *The Evolution of Gossypium* in 1944. He recently supplemented this document with the application of genetics to cotton improvement. ('Endeavor', January, 1962, p.5). He went to Cambridge as the Drapers Professor of Agriculture. In 1954 he toured the North Carolina State University and gave a lecture. H.L. Manning succeeded him on January 5, 1972. He presented the Deeds of Corporation CRS at Namulonge, Uganda to General Edi Amin, president of Uganda and the vice president of the corporation.

Sydney Cross Harland, D. Sc.; F.R.S.; F.T.I.

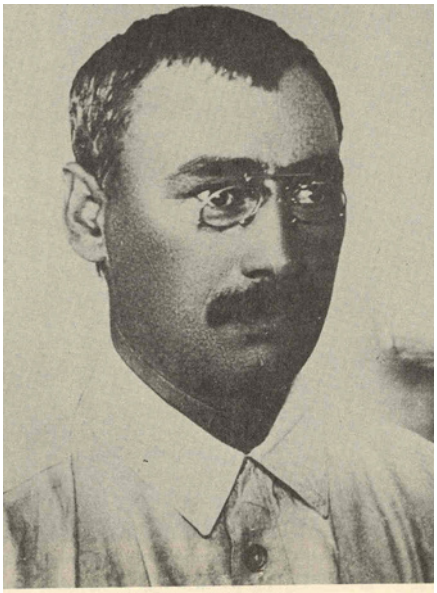
Dr. Sydney Harland was professor of Botany at the University of Manchester from 1953 to 1954. He came to India to aid and advise the ICCC under the Colombo Plan. From January to April 1956, he stayed at the Indian Research Institute, Indore. He examined and guided the cotton fibre investigation program in India. He was 63 years old at the time and a fellow of the Textile Institute. He was first appointed as Assistant for Cotton Research at the Imperial Department of Agriculture for the British West Indies. Two years later, he was elected Head of the Botanical Department of the BCIRA, Manchester. In 1923, he was appointed the Professor of Botany and Generics of the Imperial College of Tropical Agriculture in Trinidad. In 1926, he became the Chief Geneticist to the Empire Cotton Growing Corporation. In 1935, he went to Brazil as General advisor to the State Cotton Industry of Sao Paulo from 1939 to 1950, and was the Director of the Institute of Cotton Genetics of the National Agricultural Society of Peru. On 25th November 1954, he delivered the four Emsley lectures at Manchester, a series inaugurated by the textile department to commemorate the memory of John Emsley J.P. (the first fellow of the institute and president from 1922-26). The subject was "Recent progress on the breeding of cotton for quality."

J.O. Beasley

An American botanist, Beasley studied the representative types of world cottons brought together first in Raleigh, North Carolina. Later he transferred to the College of Texas. He based his classifications on chromosome constitution. He set up symbols indicative of this composition. He also verified the theory of Skovsted's of the origin of the American allotetraploid cottons. During the second World War, he was killed at the age of 34.

G.S. Zaitzev

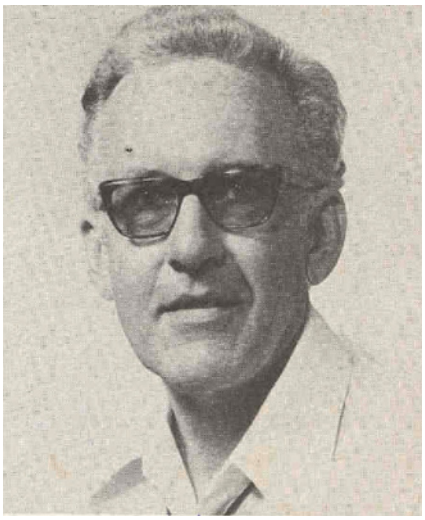
Zaitzev was a Soviet agricultural botanist. He worked on the taxonomy of gossypium cottons. He wrote a book in 1928 entitled *A Contribution to the Classification of the Genus GL*. He showed that cultivated cottons can be classified into four broad categories with 13 and 26 haploid numbers. At the age of 41, he died on January 17, 1929.



Gavriil Semenovich Zaitzev (1887–1929).

Dr. Paul A. Fryxell

Dr. Fryxell was a research geneticist for the USDA and a member of the graduate faculty of the Department of Soil and Crop Science (Texas A&M University). He was the author and co-author of 100 articles on cotton and associated plants. He carried out botanical research for 20 years on cotton in various parts of the world. His book on cotton entitled T*he Natural History of the Cotton Tribe-Malvaceae Tribe Gossypieae*, is a ready reference for the cotton scientists of the world. The following awards were conferred upon him:



B.A Magna state university, 1951
Ph.D. Iowa state university, 1955
Fellow of ASOPTaxonomists, 1983-84
Fellow of Texas Academy of science 1967
President of Society for Economic Botany, 1988-1989
Recipient cotton genetics award for 1967
Henry Allen Gleanson award for 1989
Fulbright Scholar award for study in Argentina, 1993
He is the member of several advisory boards and the honorary curator of the New York Botanical Garden.

Eminent Indian Scientists

Sri Dr. Chandrakanth T. Patel (1917-1990)

Father of Hybrid 4 cotton in India

Dr. Patel was born in 1917 at Sarsa, in the Kaira district in Gujarat. He obtained his M.Sc. degree in Bombay in 1954 in plant breeding and genetics. The evolution of sankar-4 (Intra-specific, Hybrid Gujarath-67 x American Nectariless), in the year 1970, was his immense contribution to the Indian cotton industry. It was the first successful hybrid of the world for commercial cultivation in India. With the success of this hybrid, the research development of cotton hybrids intensified and more than 45 promising hybrids have been released for commercial cultivation in different states. Hybrid 4 recorded to have the yield of 80-100 kg of seed cotton per hectare and also became popular for wider adaptability. In recognition of research findings, Sardar Patel University of Gujarat,Vallabh, Vidyanagar, bestowed him the honorary doctor of science in 1976. The Gujarat Agricultural University honored him with a Doctor of Philosophy in 1978.

He developed several new crop management techniques including nursery-cum-pot irrigation and the telephone system for cotton cultivation. Dr. Patel published more than 150 research papers in national and international magazines. He worked at Indo American Cotton Scientist as a biologist. He also worked as the cotton specialist and a Visiting Professor and Hon. Professor for post graduate students, GAU. He served as a research project coordinator for CIMF-CDRA, a zonal coordinator for AICCIP, Gujarat. He also worked as research executive at M/s Nath Agro Research Foundation. At the time of his death, he was working in M/s Hoechst seed project center.

Dr. Patel was the recipient of many prestigious awards which are listed below:

Hari Om Ashram Award, FICCI award, Federation of Gujarat Cotton Association Award, Tata endowment award by Indian Merchant Chamber, Federation of Gujarat mills and industry award, National Tonnage club award and Hexamar award.

Dr. Patel died in a car accident on December 25, 1990.

Dr. V. Santanam, M. Sc.; Ph. D.

Dr. Santanam is one of the eminent cotton scientists of India. He started his research career at the cotton breeding station in Coimbatore in 1947. He was the first national co-coordinator (1967 to 1975) of the AICCIP, sponsored by ICAR. He was the FAO expert/Adviser from 1975 to 1987 in many countries. He was a fellow of the Indian Academy of Sciences and the founding member and ex-president of the Indian Society for Cotton Improvement. At present, he is a consultant for national and overseas organizations with regard to cotton improvement projects.

Sri R. Krishnamurthy

Sri Krishnamurthy worked at the Tamil Nadu state government for ten years and in the ICAR services. He and his associates were responsible to release 9 varieties including the following:
G. Hirsutums, *like PRS.72, MCU-5 (VT), LRA-5166, Kanchana, and LRK.516). The* G.Barbadense *varieties include: Sujatha and Suvin. The* Intra-specific *varieties being Savitha.* The **interspecific**: HB-224.

Sri Krishnamurthy was awarded the following coveted awards: Rafi Ahmed Kidwai Memorial prize, in December 1973; ICAR award for the team research and the Indian Merchants' Chamber award, both in 1976; Federation of Indian Chamber of Commerce and Industry award in the field of agriculture in 1977; and Award by the Spinning Mills Association.

The Cotton Development Research Association bestowed him an award for developing high yielding medium staple cotton LRA-5166 in 1985. He retired in 1988, after a dedicated service of 38 years. During 1990-91 he was awarded the *Rao Bahadur Ramnath Iyyar Award* for genetics and plant breeding.

Dr. Munshi Singh

Dr. Singh was one of the eminent cotton-breeding scientists. Within a span of 3 decades, Dr. Munshi Singh developed G. Barbadense lines, which have been imparted photo-thermal insensibility so that these genotypes can be adopted to north Indian cottons. He released Pusa 761, Pusa 31, and later Pusa 2-95 which was a high strength medium long cotton hirsutum suitable for open end spinning technology.

Dr. Katarki

He developed the inter-specific hybrid Varalaxmi immediately after Hybrid4, which was an instant success. Dr. Katarki was a cotton scientist of high repute from Dharwad Agricultural University, Karnataka.

Staff Members who worked at TL/CTRL/ CIRCOT

Dr. A.J. Turner, M.A.; B. Sc.; D. Sc.; (January 1924 to December 1930)

Dr. Turner obtained his bachelor's degree from London University with distinction. From 1919 to the time he joined the technological laboratory at Bombay, he worked as Chair of Textile Technology at the newly established Manchester University. For some time he worked as head of the Royal Aircraft Establishment, Farnborough and conducted many experiments. In recognition of his outstanding research work, he was later awarded a D.Sc. He was offered the post of Director of the newly established Technological Laboratory, Bombay, India, in 1924, to initiate the organized research activities and improve the quality of the Indian cottons. It was a very challenging assignment. Dr. Turner built an excellent infrastructure for conducting the fundamental studies on cotton, and trained a band of dedicated research workers during his stay in Bombay. After the completion of the contract, he left India to join BCIRA, Manchester, as head of the spinning department.

Dr. Turner was associated with the Textile Institute at Manchester since 1919. He was awarded the Warner medal in 1931 and elected a fellow in 1940 for his meritorious service. His awards and medals were numerous. He was given the CBE in 1950. He was elected as Vice President from 1949-52 and President from 1952-54. He worked on the Diploma Awards Committee for 24 years, the Journal Publication Committee for 15 years, and UTMC for 19 years apart from being a member of several associations at Lambeg where he spent his last years as director of Linen research laboratory.

He passed away in October 1971 at the age of 82.

Being an Irish man, his first love of linen was obvious! But he had a genuine interest in cotton fibre and provided excellent world-class research facilities at technological laboratory. Today, CIRCOT has become one of the premier research institutes in the world for cotton research, along with a well equipped seminar hall of that seats 150 in the heart of Mumbai.

Dr. Nazir Ahmed, M. Sc.; Ph. D. (December 1, 1930 – October 31, 1945)

Dr. Ahmed completed his graduation at MAU, Aligarh and Government College, Lahore. While studying at Cambridge, he completed his M.Sc. and Ph.D at the Cavendish Laboratory in 1923 and 1925 respectively, under the guidance of Lord Rutherford. After returning to India, he became the head of the science department at Islamia college, Lahore. In 1930, he joined technological laboratory, Bombay, as Assistant Director. In December 1930, after Dr. Turner's departure, he took over as the director, and served for 15 years. He published scores of research papers dealing with almost all the technological aspects concerned with cotton fibres and yarns. The A.N. Apparatus for measuring length of the fibres and an instrument for testing individual strength of cotton fibres need special mention. Dr. Ahmed toured England and America in 1945, as a member of the Indian scientists' delegation, which studied the latest developments in science and technology. He was a fellow of Bombay University. He was in the board of VJTI, the board of visitors in UDCT, and closely connected with ICAR, CSIR, the Textile Association, and SASMIRA. When he became a member of the Indian tariff board, he resigned his post of director. In 1947, he opted to migrate to Pakistan.

D.L. Sen, M. Sc.; M. Sc. Tech. (Manchester) A.I.I.Sc.; F.R.I.C.

Dr. Sen took charge as the director of the laboratory from Dr. Nazir Ahmed in October 1945. He did his postgraduate course under Sir P.C. Ray at the University College of Science, Calcutta. He later went to Manchester in 1923 and carried out research in textile technology under professors J. Grant and A.J. Turner. After returning from England in 1924, he took up the job of a chemist in the technological laboratory, and was later promoted as a senior research officer. The American boll weevil epidemic was wide spread at that time; India imported many contaminated American bales. Sen, along with Turner, devised a successful method for the fumigation of foreign bales using hydrocyanic acid gas. Our laboratory maintained a moisture testing section at cotton exchange Sewri for a decade. Sen was in charge of this section. He was sent to England to learn the latest advances in dyeing, bleaching, sizing and finishing. In 1936, he was elected a fellow of the Royal Institute of Chemistry. In 1945 he officiated as director of the lab and was confirmed as director in 1947. After his retirement in March

1951, he became the principal at the Technological Institute of Textiles at Bhiwani.

Dr. C. Nanjundaiah, M. Sc.; Ph. D. (March 1951-September 1956)

Nanjundaiah obtained his M.Sc degree in physics from the Calcutta University under the supervision of Prof. C.V. Raman. In 1928 he was awarded a research scholarship in ICCC, Bombay, and appointed as a research physicist at the technological laboratory in 1930. He was sent to the Manchester College of Science and Technology for advanced training, where he earned a Ph.D in textile manufacture in 1949. He conducted studies on the fine structure of textile fibres by X-ray diffraction at Leeds University. He traveled on a study tour in the United States for a few months. He was awarded the fellowship of the textile in 1950 and was appointed Director of the Technological Laboratory in 1951. Nanjundaiah's contributions in the field of cotton technology as a result of research on mechanical and chemical processing treatments for cotton are very significant. He is the author of number of publications dealing with the fine structure of cotton fibres. He devised A. N. Stapling apparatus and a device measuring frictional force in fibres. His work on the ginning of cotton and the effect of moisture on fibre and yarn is quite well known. He took up the charge as the director of BTRA in September 1956. He was responsible for setting up the laboratory as well as guiding and coordinating all activities of this institution until 1970. He had many awards and accolades, including the I.N.S.A Fellowship in 1949, I.S.I Fellowship in 1967, and a medal in 1969 from the Textile Institute in Manchester for outstanding contributions to the textile industry. He was elected the Vice President of the Textile in Manchester from 1962-66. This was a rare honor, and the first time an Indian was chosen for this post. He held many distinguished positions in India as well; he was the President of the Bombay Productivity Council (1967-69), Fellow of the Bombay University, a member of the Senate, and part of the faculty of various other Indian universities. He was offered the post of Project manager of UNIDO project for textile quality control in Alexandria in 1970.

Sri Hari Rao Navkal, M. Sc.

Sri Navkal succeeded Dr. C. Nanjundaiah as Director in September 1956. He graduated from the Central College in Bangalore and did his master's degree at Calcutta under Sir C.V. Raman and Meghanad Saha. He joined the laboratory very early in 1924 as research scholar. He retired from service in January 1959. He conducted very exhaustive studies on the relationship between fibre properties and spinning. He took keen interest in helping to develop the CTRL Micro spinning technique, which is considered as one of the unique systems world over for its precision and reproducibility.

Dr. R.L.N. Iyengar, D.Sc.; F.T.I. (1957-1966)

Dr. Iyengar passed his M.Sc from Mysore University with distinction. He joined the technological laboratory in 1927 as a research scholar and worked under Dr. Turner. He was posted to the Coimbatore Station where he conducted research on the variation in the properties in the cotton fibre brought about by different genetic and environmental factors. He returned to Bombay in 1941 as a junior research officer. The Madras government offered him his D. Sc. in 1943 for his outstanding work done on cotton fibre. He was promoted as senior research officer in 1953 and subsequently to the post of director in 1957, after which Iyengar's contributions increased tremendously. He designed the halo length disc, the ginning percentage balance, a leaf vein toughness tester, a photoelectric mean fibre diameter tester, a strength tester, and an impact tester. He attended the ISO Meeting held in London in 1965. He retired from service on September 30, 1966. He worked as emeritus scientist from 1967-72 and guided several students at CTRL for their doctoral degrees. He wrote a handbook of textile testing, which was published after his retirement. Iyengar received glowing tributes for his meritorious services to the Technological Laboratory at the farewell function held on 12th October 1966. Dr. B.P. Pal, D.G, and Sri Robert B. Evans, former executive secretary of the ICAC, Washington, commemorated the splendid service done by Dr. Iyengar for the improvement of the quality of the Indian cottons.

Dr. V. Sundarm, M.Sc.; Ph. D.

Dr. Sundarm joined technological laboratory as a research officer in 1954 after acquiring a doctorate from the Institute of Science, Bombay. He became the director on October 1, 1966 and served for 22 years. He was the principal investigator for technology on December 13, 1967 under the AICCIP. Dr. RLN Iyengar had started the modernization of the laboratory during 1964-65. According to his plan, a new building was constructed and Ginning and Fibre testing sections were shifted to the new building. Some imported machines like the Platts Blowroom, Cards, Draw frame and Ring frames, Spin tester and some other machines were received in the Spinning section. Except Blow-room, other machines could not be erected due to some difficulties. Dr. Sundaram took the initiative to get them installed during his time. Several new machines were added. Ginning, fibre testing, and Miniature spinning units were installed at the Ginning training center (GTC), Nagpur. A six storey building was built on the existing lawns of the laboratory, to house the administrative offices, Library, Micro biology, Chemistry, Instrumentation, X-ray, Microscopy, Technical information sections. The new building also had the housing facilities for the Director and a Senior officer. He also arranged a HVI instrument in the F.T section. The latest addition being the most modern Knitting division was added. He was one of the recipients of ICAR award for team research and India merchants' chamber

award for outstanding work in the field of Agriculture in 1976. He received the FICCI award in 1977. He retired on April 30, 1988 (AN). He was the honorary editor of the Journal of the Indian Society for Cotton Improvement until his death. He had gone to attend a family function in the residence of his son at New Delhi. He died of heart attack on March 3, 2003.

Dr. N. B. Patil, M. Sc.; Ph. D.

Dr. Patil joined CTRL on August 4, 1969 as Senior Scientific Officer. Prior to this assignment, he worked in ATIRA, Ahmedabad, as a scientific officer. He has published a number of research papers in Indian and international journals. During his time, the name of the Institute changed from CTRL to CIRCOT (Central Institute for Research on Cotton Technology). He worked as the acting director for some years. He retired from service on December 31, 1994.

Dr. S.N. Pandey M. Sc.; Ph. D.

Dr. Pandey joined CTRL as Officiating Junior Research Officer on December 17, 1959. He was upgraded on June 21, 1962. He became the Senior Scientific Officer (SSO) on June 28, 1969 in the place of Dr. Betrabet. He was promoted as Chemist on August 4, 1975, S-2 in October 1, 1975. S-3 on July 1, 1980. He took over as the Director of CIRCOT on February 23, 1995. He was the first director to arrange an International Conference at the Lila Hotel, Mumbai. He has authored many books, and guided M.Sc. and Ph.D. students. He is the recipient of many prestigious awards. He retired on August 1, 1995. Presently he is the chairperson of the Indian Fibre Society (IFS).

Dr. K.R. Krisnna Iyer, M. Sc.; Ph. D.

Dr. Iyer joined CTRL on December 1, 1969 as a Junior Scientific Officer. A postgraduate from the Kerala University,. he worked at Ruia college, Bombay, in 1962 as lecturer, and continued for 3 years. Later he joined ATIRA, Ahemedabad, as a research fellow in physics, and earned his Ph. D,. from the Gujarat university. While working in the physics section of CIRCOT, he conducted several studies on the structure of cotton fibres, and devised an instrument for fibre length measurement (the Interferometric length measuring device). He has published over 100 research papers in reputed journals. He was promoted to the post of SSO (Physics) on September 12, 1975, and as S-2 on October 1, 1975. He became the Director on January 5, 1996. He brought transparency in management and a qualitative change in the overall work culture. CIRCOT celebrated its Platinum Jubilee in 1999. It brought immense opportunities to unearth the hidden talents of the employees and Dr Iyer exploited it greatly for the benefit of the institute. An excellent seminar hall with 150 seating capacity was added

during his time. In the year 2000, CIRCOT gained accreditation from NABL. Dr. Iyer retired on July 31, 2000. Presently, he is the Vice Chairman of the ISCI Journal.

Dr. S. Srinivasan, M. Sc.; Ph. D.; FTI; FTA

Dr. Srinivasan joined CTRL on September 2, 1974 as a research assistant. When the ASRB was constituted, he was inducted to Scientific Grade –S on October 1, 1975, Later he was promoted to S-1 on July 1, 1976. He obtained a Ph. D. in physics from the University of Kerala in 1980, and was promoted to S-2 on July 1, 1982 .He is the Chartered Textile Technologist and a fellow of the Textile Institute, Manchester, and also a Fellow of Textile Association, Mumbai. He is the recipient of V. Sivaramakrishna Iyer Memorial Gold Medal and also V.S. Subramaniya Aiyar Gold Medal. He rose to the post of the head of QEI section on September 25, 1997, and subsequently succeeded as the Director on August 19, 2000, after K.R.K. Iyer laid down his office. He has excellent organizational skills and took up the upgrade programme of Blowroom machinery, soon after he took over as the new director. Under his leadership, CIRCOT is working on a new simple model micro spinning unit, in in collaboration with TRYTEX. The unit is almost ready and is under study. He organized a seminar in June 2002 on the future prospects of knitting and knitwear. It was an instant success, and was widely accepted and appreciated! Dr. Srinivasan was in the Editorial board of the reputed textile magazine "Indian Journal of Fibre and Textile Research" for the period 2002–2004. He is destined to play a very important role in the overall development of CIRCOT. We look forward to many new ventures so that the Institute attains still greater heights in the coming decade.

Sri A.G.N. Iyengar, (1927-1959)

Sri Iyengar joined as an assistant in the spinning section early in 1927. He worked under Sri R.P. Richardson and later V.V. Gupte and retired on December 29, 1959 as the first spinning assistant. He acquired excellent knowledge in processing and testing of cotton fibres and yarns connected with various research projects carried out by eminent scientists from Dr. Turner to Dr. R.L.N. Iyengar. He was in charge of the division in the absence of Richardson and Gupte on several occasions and conducted the spinning tests independently. All the original works, including the prominent thesis "Foundation of Yarn Strength" of Dr. A.J, Turner, bear the invisible stamp of dedication and hard work of Sri A.G.N. Iyengar! He was one among the first batch of dedicated technical officers. He served for 32 years. We are proud of him!

Dorab Framji Kapadia B.A., M. Sc. (Tech) (Manchester)

He studied at St. Xavier college and later worked at one of the largest textile mills in Bombay. In 1922, he went to England and studied at the college of technology of the Victoria University in 1925. Later he worked at Brookes & Doxey (1920) Ltd. and gained much valuable experience. He

returned to Bombay and joined the Technological Laboratory in January 1928 as a research scholar. He did his M.Tech. and was promoted to the post of Assistant Technologist. Later, he left the lab and joined VJTI as a professor and also head of the textile manufacture department in July 1934.

Sri C.T. Korula, L.T.M.

He joined the lab on September 22, 1932 as junior tester. After three months his services were terminated.

Sri R.H. Kutar, L.T.M.

He joined the lab on September 22, 1932 as junior tester. After four months, his services were terminated.

Sri V.V. Gupte, B. Sc.; B. Sc.(Tech) Manchester

Gupte took over as spinning master after Richardson laid down his office in 1936. He earned his science degree from the University of Bombay. He worked in Jubilee Mills, Ahmedabad. He worked as a graduate apprentice for four years in the spinning department. He later proceeded to London where he passed B. Sc.. (tech) degree (textiles), in first class. He joined the Technological Laboratory in 1936, and conducted several studies on spinning in relationship to the fibre properties. He wanted to join a textile mill and submitted his resignation letter, but his directors persuaded him to stay on. He developed the microspinning technique at the Technological Laboratory in 1950. The small scale spinning technique was the hot topic of the cotton-breeding scientists at that time. The cotton breeding scientists in Egypt, Sudan and Alexandria were conducting several experiments. Among them, Dr. Balls was successful in guiding assistants like Dunkerley, Underwood and Hancock. The Shirley Institute at Manchester finally succeeded in designing a small working model, which was later was manufactured by Platts Machine Works. It was popularly known as the "Shirley Miniature Spinning System" during the 1960s. The CIRCOT micro spinning system is the unique single method, practiced over 52 years uninterruptedly for the benefit of cotton breeding scientists. It was further upgraded during Dr. KRK Iyer's time in catering to the needs of cotton merchants, textile mills, cottonseed companies, CCI, EICA and others. To this date, well over 80,000 samples have been spun and reported apart from the various research trials! All research trials are conducted on micro spinning before they are taken for large scale spinning. The advantage is that processing parameters can be optimized and the feasibility of various blend proportions can be assessed precisely. Gupte retired on November 17, 1961.

Sri Narayana Swamy, L.T.M.

Sri Narayana Swamy joined the lab on April 3, 1944, as the second spinning assistant, since the work of the section was enormously increased. He resigned the post on July 22, 1947.

Sri N.B. Damle, L.T.M.

Sri Damle joined the lab on July 22, 1947 and worked for short time. He terminated his service because of bad health on April 12, 1948.

Sri P.B. Joshi, L.T.M.

Sri Joshi joined on May 13, 1948 as second spinning assistant. He resigned by the end of 1957.

Sri P.G. Oka, M. Sc.

Sri Oka joined the technological lab as a temporary junior tester on November 28, 1950. He earned his M. Sc. in 1965. During his 37 years of service, he published 26 research papers in reputed Indian and International Journals. He was the first in charge of AICCIP, launched in 1967 to perform yeoman services. In recognition of this service, he was honored by the FICC by citing his name, among others, such as cotton breeding scientists, as well as the director of CTRL, Bombay. He visited the United States, the United Kingdom and Egypt for advance training in final testing under an exchange program. He was one of the founding members of ISCI magazine and worked as its Secretary and Treasurer for several years. He retired on September 30, 1987 as an S-3 Scientist. He was one of the founding members of the credit co-op society of CTRL. He is still involved with social service and keeps himself busy even after retirement.

Sri T.S. Jagannath, B.Text.

Sri Jagannath joined the lab on July 25, 1956 as second spinning assistant. He resigned by the end of 1957.

Dr. N. Balasubramanian, B.Sc. (Tech); M.Sc.;Ph.D.;F.T.I., Hon. F.T.I. (Textile Institute)

Dr. Balasubramanian was born on January 10, 1935, and graduated in science from government arts college, Madras in first class. He earned his B.Sc. (Tech) in textile technology at A.C. College, Madras; he passed in first class and stood second in the university. He worked in Sri Meenakshi Mills ltd. as an apprentice in spinning and weaving departments for 7 months. He joined the lab as a research scholar in 1956. He was promoted as Jr. research officer on March 5, 1958. During 1958 and 60, he passed part I and part II of ATI examination. He was offered the Commonwealth Scholarship in London in the Textile Industries Department of Leeds University. He resigned his post in the technological laboratory in 1963. After coming back from United kingdom, he joined BTRA, Bombay.

Sri M.S. Bhawsar, B.Sc.; L.T.M.

Bhawsar joined the lab on September 2, 1957 as second spinning assistant. When Sri A.G.N. Iyengar retired, he was promoted as first spinning assistant. He resigned the post on March 1, 1961.

Sri S.A. Shankaranarayana, B. Sc. (Text) A.T.I.; D.I.M.

Sri Shankaranarayana joined the lab on May 7, 1958 as the second spinning assistant. He earned his A.T.I. in 1959. He served as the managing committee member of the Textile Institute, Bombay branch since 1961 and also as Honorable Joint Secretary for one term. He was promoted to First Spinning Assistant on March 1, 1961. He was very efficient, strict and organized and performed the division's work extremely well. He resigned the post on October 1, 1963, and joined Sriram Mills, Bombay.

Sri A.K. Anthony, B. Sc.

Sri Anthony joined ICCC on February 16, 1959 as a senior clerk at ICCC. He transferred to the Technological Lab as a junior assistant in testing on February 1, 1961. He worked with micro-spinning processing work for several years until he transferred to Sriganganagar and Coimbatore. He took voluntary retirement on May 1, 1994 while in grade T-6.

Sri K. Shamarao, B. Sc.

Sri Shamarao joined the lab on August 1, 1959. He worked in the spinning section for a few years, after which he tendered his resignation and proceeded to England to make a career in textiles. Unfortunately, the weather did not suit him and he had to return to India. He joined CTRL once again in the same grade. He left the lab on August 17, 1970 and joined Sitaram Mills, Bombay.

Sri N.S. Gidatkar

Sri Gidatkar joined the lab on June 20, 1960 as a second spinning assistant. He resigned the post on February 1, 1961.

Sri B.M. Petkar, B. Sc.; M. Sc.

Sri Petkar joined the lab on December 5, 1960 as a junior testing assistant. He transferred to the spinning section where he worked on micro spinning. He later transferred to another section where he completed his M. Sc. and was inducted to the scientific cadre. Sri Petkar was promoted to S-2 on January 1, 1984. When Sri Oka retired in 1987, he became the head of AICCIP section. His early experience in the spinning section was useful for analyzing data and presenting his reports in the AICCIP work shops. He retired on June 30, 1995.

Sri K.S. Byrappa, L.T.T.; A.T.A.

Sri Byrappa joined on April 19, 1961 as a second spinning assistant and was promoted to the post of SRA on September 1, 1964. He was a highly devoted person with exceptionally good **managerial ability**. He directed as a powerful officer until he retired from service on September 30, 1997. He was sent to Leicester Polytechnic, England, on September 29, 1983 for ten months to train in knitting technology. He was promoted to T-5 on July 1, 1976, T-6 on November 29, 1987, and T-7 on January 1, 1994. He retired on October 30, 1997, after 36 years of dedicated service to the Institute.

Sri Gupte's micro-spinning technique was no doubt a shortened method for the bulk spinning system, but it had its share of monotonous tasks. The preciseness of gauging and drawing, the movement of slubber and inter machines, and the changing pulley drives and gear wheels required strict, meticulous monitoring. Moreover, fibre test data was not available in time. Sri Byrappa took every precaution to see that the system worked smoothly and that reports were sent out time. He maintained this same zeal and enthusiasm until he laid down his office. Several officers, including as Gupte, A.G.N. Iyengar, Shankarnarayan, Byrappa, and Shrinath, were responsible for the system's vibrant performance. During the 70's, Srinath contributed a lot in replacing the conventional Casablanca drafting system to SKF on ring frames. In 1997-98, during the time of Dr. K.R.K. Iyer, further upgrade work was taken up under the guidance of Sri Ahmed and Dr. S.K. Chottopadhyay.

Sri P.K. Jairam, B. Sc.

Sri Jairam joined CTRL on March 9, 1962 as officiating testing assistant. For few years up to 1967, he worked in the spinning section and then transferred to the FT section. He was promoted as SRA on November 11, 1971. He took voluntary retirement on April 30, 1976, and joined the AIFCSM as an officer. After retirement, he worked in the TMC program. After a short period of illness, he passed away on September 27, 2003.

Sri K.M. George, B. Sc.

Sri George joined on September 5, 1962, as a junior assistant in testing. He worked on micro spinning for a few years.

Sri K.M. Vijayaraghavan, B. Sc.

Sri Vijayaraghavan joined the lab on September 5, 1962 as a junior assistant in testing. He transferred to the spinning section on September 5, 1962. He later served in the YT and FT sections until he was transferred to Delhi by the end of 1967.

Sri K.V. Babu, B. Sc.; L.L B.

Sri Babu joined as a junior testing assistant on November 1, 1962. He worked in the yarn testing division. He transferred to spinning section and worked in Micro sample testing and reporting.

He resigned the post on September 1, 1969 and joined Prakash Roadways, Bombay.

Sri H.M. Basu, B. Sc.; B. Sc. (Tech)

Sri Basu joined as a second spinning assistant on December 11, 1962. He resigned the post on December 14, 1963.

Sri Jose Joseph, B. Sc.

Sri Joseph worked in the ICCC and later transferred to CTRL on March 11, 1965. He worked for nearly two decades in the spinning division on micro spinning processing and testing work. He was a highly cooperative and hard working person. Took voluntary retirement on February 1, 1983. (T4) He was also a very good athlete, and participated in sprinting; in relay race events conducted by the CTRL club, he won many prizes. He represented CTRL in the ICAR sports.

Sri T.K.M. Das, B. Sc.; D.B.M.; DEIM; Diploma in J; DPR; Certificate ISRS

March 15, 1963 Joined ICCC office at the administration side.
March 11, 1965 transferred to technological lab. as a research assistant.
December 6, 1976 promoted as senior technical assistant (T-4).
July 1, 1982 promoted to the post of T-5.
January 30, 1988 promoted to the post of T-6.
January 1,-1994 promoted to the post of T-7.
January 1, 1999 promoted to the post of T-8.
Retired in the post of T-8 on October 30, 2002.

For a short stint, he worked in the spinning division during 1970s although he was mainly connected with Y.T and also F.T divisions. Earlier directors identified his flair for journalism and mastery over the written word. During 1977, the manifold activities of CTRL posed an opportunity to take up the new post in Technical Information. Das completed the course of DBM in 1977, and was the most suitable candidate for the new post. He was an athlete *par excellance* in field events, including the relay race and 100 meter dash. He was an also an excellent singer. Das tastefully designed the front covers of the book of papers of various seminars, and conferences and pamphlets. CIRCOT publications, whether booklets or brochures or research findings, were presented in an excellent manner, which bears ample testimony to Das's dedication and excellence in his chosen field. Sri Das was a very hard working person. He was promoted almost every 5 to 6 years since 1976, a highly difficult and unique accomplishment. He was one of the founding members of CIRCOT's Credit Cooperative Society. He led the CIRCOT sports contingents in the ICAR sports venues for several years. He attained superannuation on October 31, 2002.

Sri R.P. Neogi. B. Sc. (Cal); B. Sc. (Tech) (Manc)

Sri Neogi joined the Technological Laboratory on January 21, 1963 as S.S.O. During that time, the PLATTS blow room machinery and Indian cards were supplied to the technological laboratory. He erected the PLATTS blowroom. He was unable to complete some of the duct and electrical panel work due to his retirement in 1970, but Sri Neogi obtained an extension for two years and completed the work in a most efficient manner. Sri Jagjivan Ram inaugurated the new Blowroom during the Golden Jubilee celebration of the CTRL. Sri Neogi retired on June 1, 1972. During his earlier years, he had the experience of working in some textile mills in South India, including a mill at Kovilpatti as a Production Manager. He was recommended by none other than Frederic Stones for the post of SSO at the Technological Laboratory.

Sri Y.A. Annaiah Setty, B. Sc.Text

Sri Setty joined the lab on November 18, 1963, as SRA. He resigned the post on August 30, 1964.

Sri H.L. Chandramouleshwar, B. Sc. Text

Sri Chandramouleshwar joined as Research Assistant on November 12, 1964 in the spinning division. He was relieved from service in 1965.

Sri P.P. Sharma, DTM

Sri Sharma joined the Lab on December 3, 1964, as a senior research assistant in micro spinning. He took voluntary retirement in the beginning of 1966.

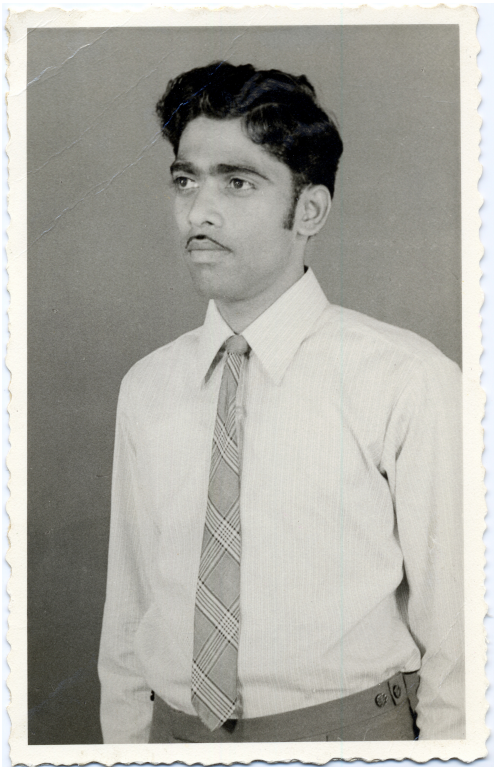
Sri N.K. Haridas, D.T.T.

Sri Haridas joined CTRL on March 11, 1967 as a research assistant. He worked on Bulk spinning. He was a very hard working person. He left CTRL in May 9, 1972, and joined a private textile mill in his native place.

Sri H.R. Laxmivenkatesh, D.T.T., ATA; L.T.I.

Sri Laxmivenkatesh studied at SKSJT Institute, Bangalore, and obtained an L.T.T. He joined M/s The Mysore Spinning and Manufacturing Co, ltd, Bangalore, as a Trainee/Supervisor and worked for two years. He later joined M/s The Tirupathy Cotton Mills, Renugunta, (AP), as a supervisor for a short stint of six months. He then came to Bombay and worked at M/s in the Podar Spinning and Weaving mills, Deslile Road, Bombay, as a quality control assistant for one year. He joined the CTRL on September 5, 1967, as a research assistant in the spinning section. He was elected as the Licentiate member of the Textile Institute, Manchester (LTI) and promoted to senior research assistant in 1972. He worked in Bulk Spinning for nearly ten years until 1977, after which he worked in micro spinning. He was associated in the project entitled "Blending of natural fibres like jute, ramie, wool and other

natural fibres with cotton." In 1996, CIRCOT started preparing the calibration cotton for HVI instruments for the first time. Laxmivenkatesh, along with Ukidwe and Nachane, under the guidance of K.R.K. Iyer, worked on the project, called "Calibration Cotton," and prepared five bales of samples in the range of short, medium, long and extra long cottons during 1996-97. He has authored half a dozen review articles on cotton production, the latest spinning technologies, and the CIRCOT micro spinning system. He initiated to improve the system and took the lead in upgrading the drafting systems on drawing, speed frames, and ring frames. Sri Ahmed and Chattopadhyay were responsible for organizing the whole programme, and all staff members and operatives dedicated their time. He published an article entitled "Muslins, Calicos and other Choicest Fabrics of India." devoted to the muslins of India in the Textile Industry and Trade Journal, No.40, Nov/Dec 2002. This research article provides an insight to the origin, production and certain ambiguity in deciding the actual fineness of the fabrics, and also the possibilities of production of machine- made muslins on a very large scale. He retired on January 31, 2004.



The author in the mid 60s

Sri Raghupathi, D.T.T.

Sri Raghupathi joined as a senior research assistant, on January 4, 1968, and worked in micro spinning. AICCIP had started only an year prior to his arrival. The pressure of work was very severe, but he worked with discipline and diligence. He left CTRL on April 29, 1972, and joined a private textile mill.

Sri B. Srinathan, B. Sc.. (Text) M.Tech.

Sri Srinathan earned his B. Sc. (Text) from SKSJTI Bangalore. He worked as a lecturer in VJTI and later served in several textile mills and at BTRA in various capacities before entering CTRL on June 25, 1969, as a junior scientific officer. He had tremendous stamina and a flair for research work on cotton. He was always ready to learn new things and implement innovative ideas. The major modernization and upgradation work took place in the 70s. He was responsible for erecting the N.M.M. ring frames, M.M.C Cards, OMS drawing and ring frames, L.R. drawing machine, super lap former, comber, uster classimat, cone winder, doubler machine, OE machine, and so on. The old single line

shaft was replaced with individual motor drives. He also installed a computerized leaf tester with printer. He also converted the drafting system of old ring frames from Casablanca to the SKF drafting system. He took a keen interest in the upkeep of the machines and in turn gave the spinning section a facelift! He trained the fitters, officers, and assistants. Those who have seen him and worked with him still recollect the good qualities he possessed and the way he used to handle problems. He was promoted to Spinning Technologist on July 3, 1975, S-2 on October 1, 1975, and S-3 on July 1, 1983. He was sent to Leicester Polytechnic for training in knitting on September 29, 1983, for ten months. He was responsible for erecting the knitting machines. He also installed the ginning machines at the Ginning Training Center, Nagpur. He later visited USSR for 28 days, from August 26 to September 16, 1988, under the Indo-USSR Study Program in Breeding of Cotton and Seed Processing. He undertook the project of blending cotton with jute, wool, and ramie on the short spinning system in 1977. Srinath, along with Sathe and Laxmivenkatesh, completed the project successfully. Several studies on blends of Pineapple fibre, Banana fibre, Silk, and Kapok fibre with cotton were also undertaken. He was in charge of the knitting section until he took voluntary retirement on April 30, 1992. He retired as the Principal Scientist.

Sri I.H. Hunsikatty, B. Sc.; A.T.A.

Sri Hunsikatty joined the Dharwar Center on September 11, 1969. He transferred to the Surat branch on July 1, 1974. He was terminated from service on November 17, 1975 and reappointed to the spinning section at CTRL in Bombay, on May 7, 1977. He was promoted to senior research assistant on January 1, 1984, T-5 in January 1, 1990, and T-6 on July 1, 2000.

He was hospitalized for jaundice and passed away on January 3, 2002. A brilliant person with only four years until retirement was no more!

Sri M.S. Parthasarathy, M. Text.(Bombay); M. Sc. Tech (Manchester)

Before coming to CTRL, Sri Parthasarathy worked at SITRA as a research officer for 15 years. He joined CTRL as head of the Mechanical Processing Division on April 6, 1972. He was deputed by ICAR to the United Kingdom under the Colombo Plan between 1961-63. He became S-5 on January 1, 1985. During his tenure, the Mechanical Processing Division underwent a major remodeling. Several new projects were taken. A new knitting section was started with the latest knitting machines. Sri Parthasarathy was promoted to the post of principal scientist and retired on April 31, 1995.

Sri Y.P. Tripathy, M. Sc.

Sri Tripathy joined the lab on May 2, 1972, as a research assistant. He was a very intelligent and hardworking young man. He looked after the processing of micro spinning samples. He took voluntary retirement on August 1, 1974, and left CTRL to join the Birla group of mills.

Sri S. Chandrasekhar, L.T.M.; Certi in S.Q.C., in textile industry (SASMIRA); ATA

Sri Chandrasekhar joined the CTRL on October 11, 1972, as a senior research assistant. Before coming to the lab, he worked in M/s Bombay Dyeing and Manufacturing Co, Bombay, as an sssistant (I.E. department) from 1971-72. After obtaining his LTM from VJTI Bombay in 1967, he started his career as an investigator in the Quality Control Department at M/s Jupiter Mills, Bombay, from 1967-69. He later worked as a laboratory spinning assistant in M/s Kiran Synthetic Spinning Mills, Thane (1969-71). At CTRL, he initially started in micro spinning and later worked in bulk spinning. In 1987, he was sponsored to Leicester, UK, for training in knitting technology at the Leicester Polytechnic for ten months. He was promoted to Technical officer's grades, T-5, T-6, and T-7 in 1980, 1995, and 2000, respectively.

Sri A.S. Sathe, B.Tech.

Sri Sathe joined CTRL as a senior research assistant on December 1, 1973. He was selected for a project entitled "Blending of cotton with fibres like Jute, wool, Ramie and other fibres." When the ICAR posts were reorganized; he was assessed in the cadre of Scientist –S. He took voluntary retirement on May 25, 1977, and joined Maharashtra State Cotton Marketing Federation as an officer.

Dr. D.N. Makwana, M. Sc.; Ph. D.

Dr. Makwana joined CTRL as a research assistant on September 2, 1974. He was inducted on October 1, 1975 in the Scientific Cadre and promoted to S-1 on July 1, 1982. He took charge of AICCIP after Sri Petkar retired and is successfully managing to this day. He has established an excellent coordination between CIRCOT scientists and the cotton breeding scientists, in providing the technology support at the appropriate time. At present he is a Senior Scientist.

Sri D. L. Upadhye, SSC (Tech), NCTVT (ITI & CTI); Training in B.R to R.F Assembly

Sri Upadhye joined the lab on July 14, 1975, as a machine operator (T-1-3). He was promoted to the grade of T-2-3 on July 1, 1982. He was again promoted to the grade of T-4 and T-5 in July 1, 1984, and July 1, 1993, respectively. He now works in MPD/knitting. His contribution in upgrading the spinning machines and Blowroom machines is praiseworthy.

Sri T. N. Ramamurthy Rao, B. Sc., B. Sc. (Tech), M.Tech.

In public interest he was deputed from the UP government, holding the charge of Senior Class I Officer's Post of fibre scientist at C.S.W.RI, Avikanagar. He benefited from a revised pay scale of Rs.1100-1600 along with his permanent post to this lab, effective on December 5, 1975. He took charge of the Mechanical Processing Division in 1985. He was promoted to S-3 on July 31, 1982. He retired from service on October 31, 1989, in the grade of Principal Scientist.

Sri Muntazir Ahmed, B. Sc.; B.Text.

Sri Ahmed is presently holding the post of principle scientist and Head of MP Division. He was among the first batch of ARS scientists to graduate and join CTRL in the grade S-1 on December 29, 1976. Before joining CTRL, he worked as shift-in-charge in a composite textile mill at Kanpur. He worked as the assistant cotton technologist in the U.P. State Government for six years. He obtained a special certificate in knitting from De Mont Fort University, UK, along with the position of technical officer on September 21, 1986, for a period of 10 months. He organized a knitting seminar in 2002. He worked on naturally colored cottons and blends of ramie with cotton. Among other things, he has published several scientific articles in English and receivedd many awards for his Hindi articles on knitting. He is frequently invited to deliver lectures on knitting in various textile institutes. He is also the resource person for various refresher courses and workshops conducted on weaving and knitting.

Smt. Kamath B. Sc.

Smt. Kamath joined on January 15, 1981, as a technical assistant (T-2-III). Her late husband, Sri K.R. Kamath, was a very hard working and intelligent person who worked as a senior research assistant in Y.T. Section. After the premature death of Sri Kamath, she was appointed on compassionate grounds. She was promoted as a senior research assistant on January 1, 1988. She worked as a technical officer, T-5, until she took voluntary retirement on April 1, 2002.

Sri H. Sengupta, B. Sc.; (Part-1), Dip. Textile Tech.

Sri Sengupta joined as a technical assistant (T-2-III) on March 1, 1982, and worked on the micro spinning system. He was an extremely disciplined and hardworking person. For personal reasons he was transferred to JTRL, Calcutta. He was relieved from duty on March 26, 1985.

Dr. Anap, B. Tech; M. Tech; Ph. D.

Dr. Anap joined CIRCOT in 1984 as an S-2 Scientist. He transferred to GTC, Nagpur, and

completed doctorate in 1997. He transferred to CIRCOT Mumbai on July 28, 1995, where he took charge of the MPD for a few months. He took voluntary retirement on September 1, 1998 (AN), as a Senior Scientist.

Dr. S.K. Chattopadhyay, M. Tech.; Ph. D.

Dr. Chattopadhyay joined CIRCOT on April 1, 1985, as an S-1 Scientist by passing the ARS examination. He completed B.Sc. (Tech) in textile technology from the University of Calcutta. He later did his M. Tech. in textile engineering from Indian Institute of Technology, Delhi. He worked for four years in textile mills in various capacities. He has published and presented more than 80 research papers in reputed Indian and International journals. He earned his Ph. D. (Tech) in textile technology from the University of Mumbai. He is the recipient of the National Scholarship, the W.B. Government Merit Scholarship, the UGC Scholarship, the G.K. Sundaram Shastyabthipoorti Award, the Textile Association Award, and the Dr. Triguna Sen Medal of the Institution of Engineers (India). He is the Fellow of TAI and IE (India). He is also a member of ISCI. After taking charge of the MPD in 1997, he built an excellent team of dedicated officers, assistants and operatives. The spinning section has received an upgrade since then. A new ring frame and a speed frame were installed. Among other things, the CIRCOT micro spinning system was refurbished by installing a pneumatic top roller weighing system in the draw frame and converting the Casablanca system to the SKF system on a conventional speed frame. Many innovative R&D works are still in progress. He initiated some improvements in the working conditions of SMS methods, which are already in use. The TRYTEX Company of Coimbatore is now implementing the new technology support given by CIRCOT. Dr. Chattopadhyay has guided a number of students from VJTI for Diploma, Graduation, and Post graduation thesis work.

Sri V.V. Murudkar L.T.M.

Sri Murudkar joined CTRL on June 19, 1987. He worked for some time in micro spinning and assisted in the assessment of yarn faults on the Classimat-II machine. He had taken keen interest in the modernization of the spinning section and has worked very hard. He had a bright future ahead, but cancer unfortunately claimed his life. He breathed his last on December 22, 1998.

Sri H.S. Jayaprakash Narayan, B.Tech

Sri Narayan joined CIRCOT as an STA on November 3, 1989. He worked in micro spinning processing and also on the Classimat-II. He received a job in Karnataka, and hence resigned his post on June 8, 1992.

Sri R.K. Jadhav, B.Sc.

Sri Jadhav was appointed to CIRCOT's out station office at Nanded on December 18, 1989, in the grade of T-II-3. He transferred to Mumbai and worked in the FT section for few years. He later transferred to the MPD in 1995. He was promoted to the post of T-5 on March 1, 2002, and took initiative in the modernization of the mechanical processing division. He deserves much encouragement.

Sri D.R. Kunder B.Sc.

Sri Kunder joined as a technical assistant (T-2-III) on June 6, 1992. He worked for a short period on micro spinning processing in MPD, and resigned on October 12, 1992.

Sri D.U. Kamble, B. Sc.

Sri Kamble joined on June 10, 1992, as a technical assistant (T-2-III). He was promoted to the post of senior technical assistant on July 1, 1997. He has taken a keen interest in understanding the various processes and completes his assigned work promptly and diligently. He attended to the micro spinning processing, testing and reporting work during the peak period of the season on many occasions. Now he is quite able to handle bulk spinning processing work independently. He has registered his name for M.Sc. He was deputed to Messrs. Textool, Coimbatore, and trained in the carding technique. He is also a very good social worker. He worked in preparing the calibration cotton for HVI testing machine. He deserves much encouragement.

Smt. Bindu Nair, B. Sc.

Smt. Nair joined as a technical assistant on November 5, 1992. She worked in the processing of micro spinning for nearly 10 years. She was very keen on learning all the facets of spinning in general and micro spinning in particular. She was promoted to T-4 on January 1, 1998. Presently she is attending to the micro testing and reporting work. She is also analyzing the fabric sample for the weave and related works of the section, including bulk spinning, cotton trash estimates, and Classimat yarn unevenness studies. She prepared the calibration cotton for HVI testing machine and deserves much praise.

Sri N. Shanmugam M.Tech; M.I.E.

Sri Shanmugam joined as a Scientist on December 24, 1997. Before coming to CIRCOT, he worked as an Inspector on the Textiles Committee, Chennai, from 1987 to 1997. After obtaining his

diploma in Textile Technology at PSG College of Technology, Coimbatore, in 1983, he joined Sri Ramakrishna Mills, Coimbatore, as a supervisor from 1983 to 1987. He was very keen on improving his qualifications. While working on the Textiles Committee, he passed the examinations of the Institution of Engineers (India), in 1990. In 1994, he was awarded a Master in Textile Technology from Bharathiar University, Coimbatore. He was further awarded an M.I.E. from the Institute of Engineers (India) Calcutta, in 2002. He received the Best Project Award for his project entitled, "The effect of single and double end feeding at ring frame on yarn properties of TANDEM and IRHP material." He earned an 'A' grade at the foundation course training of ARS and successfully passed the Indian National Eligibility Test for lectureship in agricultural universities. He earned a prize in the best paper competition from The Textile Association (India). He has published more than 28 research and review articles in international journals. He coordinated and ensured the implementation of NABL quality systems at CTRL. He produced a fine count of 50s Ne from polyester micro denier/ cotton blends in OE spinning. He developed yarn quality prediction models based on artificial neural networks. He conducted research projects in post harvest technology of cotton. At present, he is busy with his Ph.D. work.

Sri A.K. Chaphekar, M.Tech

Sri Chaphekar joined MPD as TA (T-2-III) on July 13, 1999. He assisting in microspinning and research work.

Sri A.P Modak, B.Tech

Sri Modak joined MPD as a TA (T-2-III) on July 22, 1999. He initially worked on bulk spinning. Since 2002, he has been working on micro spinning and assisting research projects as well.

Sri Lallan Shaw, M.Tech

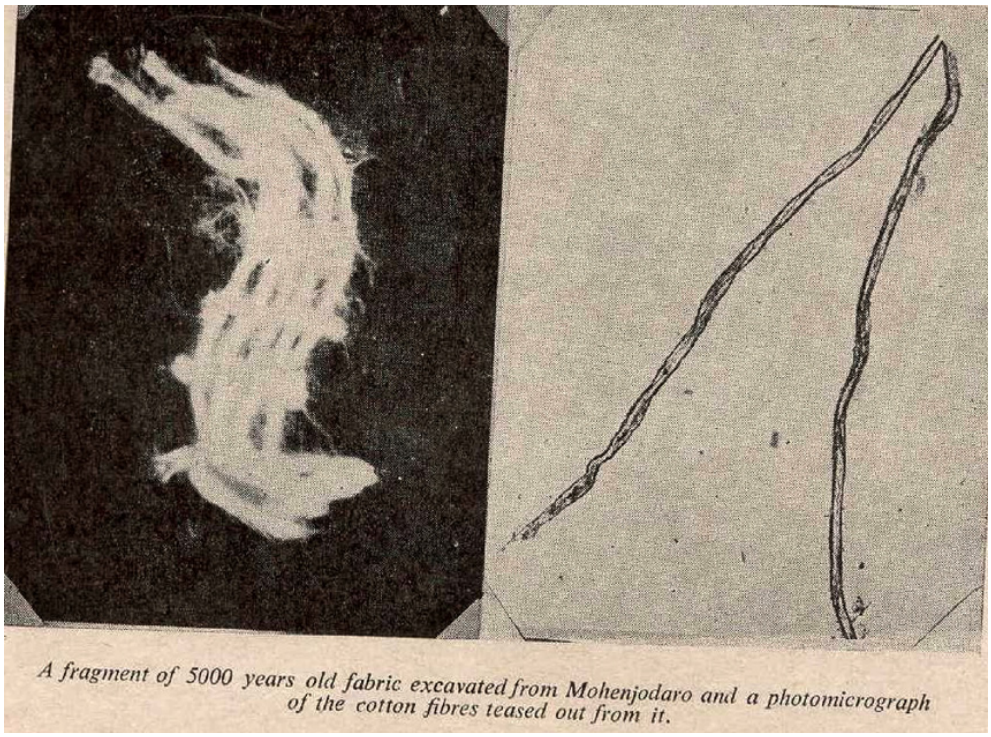
Sri Shawa joined as a research associate on January 2, 2000. After working in MPD for few months, he was terminated on May 1, 2000.

Sri Samantha, M.Tech

Sri Samantha worked in MPD with Dr. Chattopadhyay on a project on wool blending. He got an offer of lecturer's post in NIFTI, Calcutta, and left CIRCOT, Mumbai.

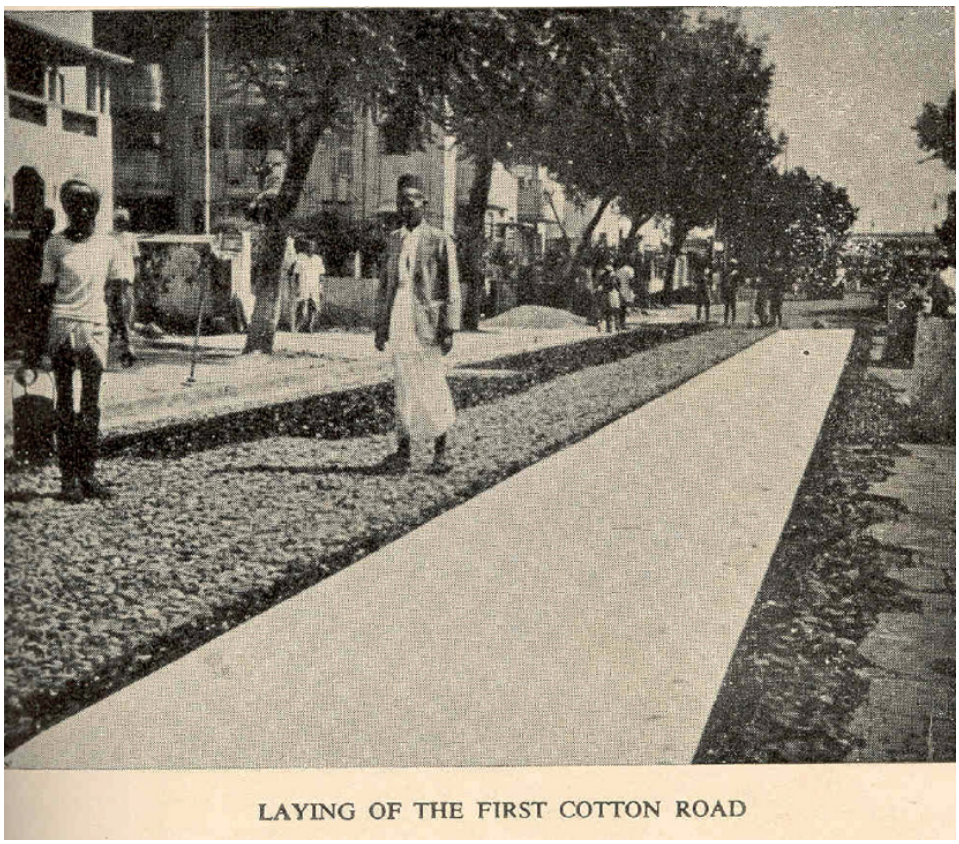
Smt. Rohini Gaikwad M.Sc.

Smt Gaikwad began work under Sri Muntazir Ahmed in the knitting section in 2001. After completion of the term, she began work in the physics division under Dr. R.P. Nachane.



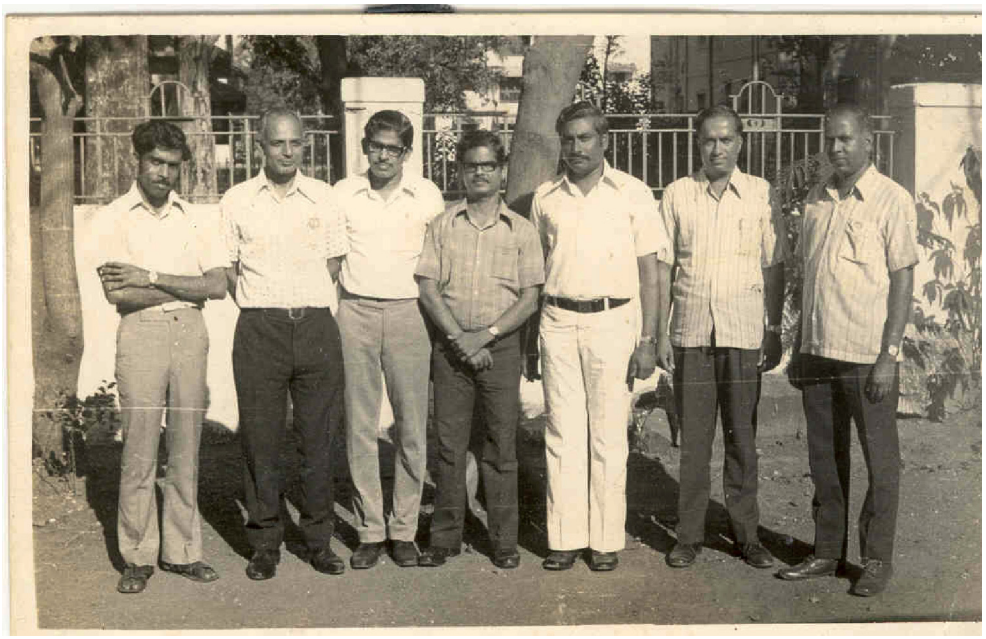
A fragment of 5000 years old fabric excavated from Mohenjodaro and a photomicrograph of the cotton fibres teased out from it.

A fragment of 5000 year old fabric excavated from Mohenjodaro and a photomicrograph of the cotton fibres teased out from it



LAYING OF THE FIRST COTTON ROAD

Laying of the first Cotton Road



Along with CIRCOT'IANS
Sri H.R.Laxmivenkatesh, Sri M.S. Sitaram, Sri N. Tejappa, Sri P.K. Jairam, Sri B. Srinathan, Sri T.N. Ramamurthy Rao, Sri K.S. Bhyrappa

The author receiving a prize from Smt. Usha Mehta, noted Gandhian

Author with Sri Murudkar (Late) and Sri Bane

Sri M. Ahmed, Sri S.K. Chattopadhyay, Sri H.R.Laxmivenkatesh, Sri S.Chandrasekhar. Sri Vijaya at VJTI, Mumbai where CIRCOT hosted an exhibition on Organic Cotton

Operatives

Sri Dahya Gosai

Worked during the time of Sri V.V. Gupte as a temporary fitter for carrying out ginning work for three months, from March 15, 1937, to June 14, 1937. It is not known whether he continued further, since the ginning section came to being only in 1940-41.

Sri V.K.Naik

Worked as fitter in the spinning section for many years.

Sri P.G. Patil

Joined the laboratory on April 1, 1948 as a fitter in the place of Sri V.K. Naik.

Sri Gangaram Patekar

Brother of Sri Sitaram Patekar. He worked on ring frames and speed frames.

Sri Ramji Ganapath

Elder brother of Sri Chintoo Ganpath. He worked on ring frames.

Sri Kashiram Balu

Regular machine operator. Worked for several years in the Blow Room.

Sri Chintu Ganapath

Had mill experience and worked on ring frames for a number of years. He was highly skilled and kept the machines in excellent condition.

Sri Sadashiv Jairam Warang

Popularly known as master. He was a very hardworking person. He had a thorough knowledge of the machinery. He worked on speed frames, ring frames, and reeling. He would occasionally bring the samples from the Railway Parcel Office.

Sri Sakharam Jilloo

A highly devoted worker of immense potential. With the available two carding machines, he used to run 2000 micro samples and 650 bulk samples. He was provided with an assistant. Mostly he worked on cards for several years, although he was capable of working on every machine. Unfortunately he

suffered a severe heart attack during his tenure and died in his house.

Sri Thamabhiwaji Dangle

Joined the Technological lab on March 1, 1939. He was the main fitter when I joined the lab in 1967. Sri Keshav Verja ably assisted him.

The period from 1960-1979 was a period of intense activity at CTRL and the spinning section was no exception. Many new machines were installed. Several new projects were undertaken. Blending of cotton with other natural fibres, like wool, ramie, jute pineapple, kapok, banana was one among them. The AICCIP was at its peak. Thama's contributions will always be remembered. He retired on November 30, 1979.

Sri Ranga Swamy Pillay

Operated Slubber, Inter, Roving and Jack frames.

Sri Dasharath

Operated speed frames and ring frames. He had experience in running other machines as well.

Sri Keshav Pacha

A very hardworking operative. He ran the speed frame for a long time. He met with an accident and passed away on October 18, 1969, while in service.

Sri Keshav Verja

Worked as an assistant fitter when I joined in 1967. He was a very capable person. He retired at an earlier age because he furnished an incorrect age in his service record.

Sri Sitaram Nagoo

Better known as S.N. Salve, he worked as a boiler attendant in the spinning section. He transferred to the workshop section. He attended the work of fitter in spinning section in the absence of Thama Bhiwaji Dangle. He retired on June 30, 1980, in the grade of T-1-3.

Sri Ramachandra Abaji Dalvi

Joined the technological laboratory during the time of Sri D.L. Sen on September 30, 1946, as an operative. He worked in the blow room and with carding, drawing, speed frames and reeling machines. He used to bring sample parcels from the train station. He retired on July 1, 1981, in T-2 grade.

Sri Popat Jairam Ahire

Joined the lab on September 1, 1960 as an operative. He was highly duty conscious and very hardworking. He was attending Ring frame when I joined. Later he was promoted to fitter. He retired on July 31, 1995, in the grade of T-1-3.

Sri M.M. Rupawate

Joined as a lab boy on March 1, 1955, while in tenth standard. Hardworking and diligent, he was later promoted to operative and senior operative. He worked in the blow room for a long time and afterward on draw frames (T&S as well as L.R. Drawing machines), carding machines, and the reeling machine. On many occasions he would bring samples from the parcel office. He retired on July 31, 1991.

Sri Sitaram Patekar

A very senior operative, worked on virtually every machine. He had mill experience. When the Platts blow room was commissioned, he was the first to operate the Finisher Scutcher machine. He took voluntary retirement on November 18, 1979.

Sri H.B. Thambe

He joined the laboratory on September 21, 1955, as a lab boy. He was able to operate all the machines. Mainly he used to look after the speed frames. He was a very diligent person. He later transferred to the work shop and worked as a plumber. He retired in 1998.

Sri Makkan

Works in the spinning section, specially in the blow room.

Sri Mubarak Raju Nawab

He worked in the ginning section, where he suffered an accident and lost one of his eyes. He then worked on the reeling machine, and used to bring sample parcels from railway go-down. He took voluntary retirement on May 31, 1978.

Sri Puroshatham Vira

Joined the laboratory on November 15, 1954 as an operative. When I joined he was working on ring frames. Like Thama Bhiwaji, he was a highly devoted worker. He was promoted to T-2 grade on July 1, 1982. He retired on July 10, 1989, as fitter.

Sri Govindmahadev

Joined in 1954 as a peon in the spinning division for a long time. He later started working as supporting staff. He took voluntary retirement in 1978.

Sri P.K. Gopalan

Joined on March 30, 1961 as a lab boy in eighth standard. He worked from the blow room to ring frame and reeling. He was a very hardworking and dedicated person. His photo has appeared in several annual reports, depicted as opening cotton by hand bow. He was promoted to T-1 on December 16, 1976, and to T-1-3 on January 1, 1990. He suffered from a heart ailment and died in the hospital while he was in service on May 21, 1991. Unfortunately, his wife passed away that same year.

Sri T.R. Kadam

Joined the laboratory on September 13, 1961 in the post of Hamal. He was promoted to the post of senior operative on May 10, 1990. He had training in weaving and knitting and worked in MPD until his retirement on May 31, 1997, in the post of T-1.

Sri K.D. Mohite

Joined on September 12, 1961 as a lab boy in tenth standard. He officiated as SS grade IV, w.e.f. July 13, 1978, and was further promoted to T-2 on November 23, 1999. He worked for a long time on the Lakshmi Rieter speed frame. He was well versed in working on all the machines. He was also a good social worker. He retired on November 30, 2000.

Sri K.Vasudevan Nair

Joined on April 17, 1962 as a lab boy in tenth standard. He officiated as T-1 w.e.f. December 16, 1976. He was learned in the operation of every machine, from the blow room to ring frames. He acquired special skill in running micro spinning samples on drawing, speed frames and ring frames. He took a transfer to the Coimbatore unit on July 9, 1980. He worked there on the Shirley miniature spinning unit for nearly ten years. He retired on January 1, 1990, in the grade of T-1-3.

Sri H.K. Pawar

Joined on June 6, 1963 as a lab boy in seventh standard. He was officiated as T-1 w.e.f. December 16, 1976. He had the practical experience in working on the comber machine. He was familiar in running the OE machine. He knew all of the intricate setting points, having worked with the engineer who install the machine when it was acquired in 1979. He also had the practical experience of settingcarding machines and he looked after grinding schedules. He was promoted to T-1-3 on January 1, 1990 and retired on July 31, 2001.

Sri D.B. Gadankush

Joined on January 22, 1964 as a lab boy in tenth standard. He was officiating as a senior operative w.e.f February 8, 1980. He passed the certificate course in cotton spinning in April of 1978. He was promoted to T-2 on January 1, 1988, T-1-3 on July 1, 1994, T-2-3 on January 1, 1995, and subsequently T-4 on January 1, 2000. He was very helpful and very adjustable to the needs of the occasion. He worked on practically all of the machines, and worked as a fitter as well. He was the captain of the Kabaddi team, representing ICAR sports in various centers and winning several medals. He retired on May 31, 2000. After suffering from a short illness, he passed away in 2003.

Sri D.J. Raut

Joined the laboratory on March 1963 while in ninth standard. He worked in the spinning section as a lab boy. He completed SSC and went to the office side, where he worked as a cashier and later as an assistant. Before then, he worked in spinning as a store clerk. He took voluntary retirement on May 17, 1986, and joined his family business, M/s Ameeth Trading Company. The company is an agent for textile testing instruments. They also make testing instruments.

Sri Bechan Nokai

Joined the lab on January 14, 1964, as an operative. He worked on ring frames with both micro and bulk spinning. He worked in M/s New City Mills before coming to CTRL. He was promoted to T-1 on December 16, 1976, and subsequently to T-1-3 on January 1, 1991. Having worked in a mill, he was very good with the upkeep of the machines and was able to run two to three ring frames effortlessly if needed. He took voluntary retirement on January 31, 1994.

Sri R. G. Chiplunkar

Joined the lab in January 22, 1964, as a lab boy in eighth standard. He worked in microscopy section for several years. He was transferred to MPD and underwent training in weaving. He worked on the Classimat and reeling machine. He is a weaving certificate holder. He later worked in the knitting section. He rose to the position of T-1 and retired on February 2, 1998 (FN).

Sri S.G. Shinde

Joined the lab in September 1, 1966 as a lab boy in eleventh standard. He was very devoted to his duties and worked on almost all machines. He attended the Mafatlal Gagalbai Technical School and passed the certificate course in spinning in first class in May 1978. He was promoted as senior operative w.e.f. February 6, 1980. He was further promoted to T-2 on January 1, 1988, T-1-3 on July 1, 1994, and T-2-3 on July 1, 1995. He rose to the position of STA (T-4) on January 1, 2000. He retired on April 30, 2003.

For the last two years, he looked after the stores work. He received a farewell party on June 18, 2003.

Sri M.B. Thokrul

Joined in September 1, 1966 as a peon in eleventh standard. He worked in the blow room and with carding and micro spinning, especially on mini drawing machines. During the drawing process, piecing plays a very significant role. In fact, the majority of the faults in the later stages are attributed to drawing faults. This is more pronounced while running micro samples. Sri Maruthi Thokrul demonstrated exceptional skill in this area, a skill he possesses even to this day. He was promoted to T-2 grade on November 23, 1999. At present, he is working on trash separator machines.

Sri K.K. Kasar

Joined the lab in April 19, 1968 as a lab boy in tenth standard. He was an exceptionally skilled and dedicated worker. He had a constant smile on his face and carried out all of his work diligently. It is unfortunate that he passed away on July 18, 1998.

Sri R.R. Khurdekar

Joined on November 23, 1968 as a lab boy. He studied up to ninth standard. He worked in the blow room and on carding machines. He eventually left spinning and joined the chemistry section. He was promoted to T-2 on November 23, 1999.

Sri Babu Aba Babar

Joined the spinning section on October 1, 1971, as a lab boy. He studied up to fourth standard. He was appointed for a temporary period during the cotton, jute, wool, and ramie-blending project. He had experience working in mills and possessed excellent skills with ring frames. He looked after micro spinning and various blend trials taken during the project. He retired on January 31, 1990.

Sri M.R. Nevrekar

Joined lab on December 22, 1972 as a peon. He studied up to eleventh standard. He transferred to the spinning section. He has worked in the blow room and with carding and drawing machines. He is very devoted and highly work conscious.

Sri G.G. Amabare

Joined the lab on August 2, 1973 as Mali in eighth standard. After working for several years, he was transferred to the spinning section. He worked in the blow room and with carding and drawing frames. He was promoted to senior operative on September 21, 1991, and subsequently to T-2 on November

23, 1999. At present, he works on the miniature drawing machine, processing micro spinning samples. He also has knowledge of Ayurvedic medicines and has devised oils to treat arthritis.

Sri A.R. Bane

Joined the lab on September 13, 1973 as a peon. He has passed tenth standard. He is very intelligent and has the ability to operate all of the machines, including the comber, OE, doubler, cone winding, and Classimat machines. He was promoted to machine operator on January 16, 1993, and T-2 on November 23, 1999. He has proven to be a very useful person. He passed the certificate course in spinning from Mafatlal Gagalbai Technical School in 1987 in first class. He is also an accomplished artist of very high calibre; he has drawn beautiful banners and prepared exhibition display boards extremely well. He has also helped many graduate and post graduate students by providing graphics for their theses. He deserves encouragement.

Sri T.S. Mhaske

Joined the lab in January 4, 1974, as Sweeper. (Up to S.S.C). He was working as a peon for quite a long time in the spinning section. Later he learned to work in blow room and with carding and ring frames. Now he works on ring frames and attends bulk spinning, micro spinning, and research samples as well. He deserves encouragement.

Sri G.S. Deorukhaar

Joined the lab on September 1, 1974 as Farash. He passed eleventh standard. He transferred to spinning, where he learned to work on all of the machines. He is extremely good with micro spinning and drawing on the speed frame and ring frame. He also passed the certificate course in cotton spinning. He was promoted to T-2 on November 23, 1999. He now works as a fitter whenever the need arises.

Sri S.G. Waghela

Joined the lab in September 1, 1974 as a Sweeper in eleventh standard. He worked as a peon in the account section for several years. He later transferred to spinning section. He was very fast in learning the work from blow room to ring frame. He was promoted as machine operator on March 9, 1994, and further T-2, on November 23, 1999.

Sri B.K. Sawant

Joined the lab on September 1, 1974, as Farash. He studied up to tenth standard. He transferred to the spinning section from the workshop. He has worked in blow room and with carding, drawing, speed

frames, and ring frames. He was promoted to T-1 on December 16, 1995. He worked very hard during 1997-98 and assisted with the erection work of the speed frame, ring frame, carding machines and other machines. He should be encouraged.

Sri Batnislal Balmiki

Joined the lab on June 13, 1975 as Hamal-cum-sweeper. He was working in blow room and carding. Got a transfer to IVRI Izat nagger w.e.f November 25, 1989. He was working in the grade of SS-Grade II. During his stay at CTRL, he worked in Blow-room and Carding machines.

Sri B.R. Jadhav

Joined the lab on May 1, 1978 as supporting staff Gr-I. He has passed S.S.C; He worked in micro biology and Y.T sections and subsequently transferred to spinning section. He is very hard working, highly dependable, and very punctual. He is equally well trained to operate all the machines in the spinning section. He worked on micro spinning unit consisting of drawing, speed frames and ring frame for more than 12 years and acquired mastery over CIRCOT Micro spinning technique. He took training at Ms.Textool, at Coimbatore in Carding and Ring frame sections. He was promoted to T-2, on November 23, 1999. He is training the new operatives of all the intricacies of this specialized technique. He deserves all the encouragement.

Sri S.M. Sawant

Joined the lab in May 1, 1978, as supporting grade-1. He has passed upto S.S.C; He was promoted to T-1, on December 17, 1995. He was transferred to spinning section and has been working in Blow-room. He lost his fingers while working in blow-room. He is very sincere and hard working person. Deserves all the help and encouragement.

Sri M.B. Guruve

Joined the Institute on July 10, 1978 as a peon. (up to Xth) He was working in the office side. Got transferred to MPD and worked for few years. He was transferred to Accounts section. He has good command on Hindi language. Won many prizes during the Hindi competition conducted almost every year.

Sri K.P. Somasekharan

Joined the lab on December 16, 1978 in SS.Grade I. (Upto IXth). He worked in Blow-room and carding machines. He was very hard working person. He took transfer to his native place-Kerala.

Sri M.B. Chandanshive

Joined the lab in January 2, 1979 as Supporting staff Gr. I (Hamal cum Safaiwala) He has passed X Std; He was spotted by Sri Srinath, who took him in spinning section. He learnt to work on almost all the machines. He passed the certificate course in cotton spinning in first class. Promoted to the post of T-I-III on September 7, 2001. He deserves all the encouragement.

Sri M.Y. Chandanshive

Joined the Laboratory on May 1, 1978 in the grade of Supporting Staff Gr.1 (SSC). He was working with Sri P.G.Oka and Sri B.M. Petkar for several years. Later got transferred to MPD. Now he has learnt to operate the machines starting from Blow-room to Carding and also Drawing machines. He deserves all the encouragement.

Sri B.R. Satam

Joined the lab on April 2, 1979 as Supporting staff Gr.I He has passed upto S.S.C; He is working as peon, in MPD, for quite a long time.

Sri M.K. Ghadge

Joined the lab on May 25, 1980, in the supporting staff Gr. I He has passed VIII Std; He was working in Library, before he got transferred to spinning. Ghadge is attending the work of bringing the sample parcels from the railway station. He is running the knitting machine.

Sri Raghunath Singh Gosai

Joined the Lab on October 15, 1984 as watch- man in the grade of Gr. 1. (SSC) He was transferred to MPD. He has learned to operate the machines from Blow-room to Ring frame. He was promoted to the grade T-1 during the present year. He has also undergone training at the Small Scale Industries Institute, Sakinaka, Mumbai. He deserves all the encouragement.

Sri S.A. Phalke

Joined the lab on April 5, 1990, in the grade of S.S.Gr.I. (SSC). Promoted to grade S.S. Gr. II in 2001. He was transferred to MPD in 1997. Since then he is working on all the machines in spinning section. He is young and picks-up the work very fast. He deserves all the encouragement.

Sri D.G. Gole

Joined the lab on July 19, 1990, in the grade of S.S.Gr.I. (SSC). He has passed a course in Librarian-ship. He came to MPD and has been working on cards and Blow-room machines. He has attended the

work of micro drawing, and has run several samples. He is young and picks-up the work very fast. He deserves all the encouragement.

Sri S.N. Bandre

Joined the Institute on September 17, 1990 in the grade of SS.Gr.I. (UPTO HSC). He was working as telephone operator. Now transferred to MPD. He is very intelligent and devoted person. Inspite of attending the clerical duties, he is helping his colleagues in Blow-room and Carding machines. He deserves all the encouragement.

Sri S.K. Parab

Joined the Institute on March 9, 1992, in the S.S.Gr.I. (SSC) He was sent work in spinning section. He has learnt to work on all the machines, starting from blow-room to Ring frame. He is very sharp in understanding the various processes. He has passed the certificate course from Mafatlal Gagalbai Technical School. He has undergone training at Small-scale industries institute, Sakinaka**,** Mumbai, and got the certificate. He was promoted to the post of T-2 on October 1, 1997. Being a young person a bright career is ahead of him.

Sri A. D. Sonawane

Joined the Institute on June 7, 1993, in the grade of SS.Gr.I. (IX) Now he is transferred to MPD. He is attending Carding and Drawing machines (Old T&S). He deserves all the encouragement.

Sri S. Surukule

Joined on October 5, 1999 in the grade of SS.Gr.1. Transferred to MPD in 2002. He is working on Micro spinning drawing machine. He deserves all the encouragement.

Clerical Staff

Sri D.C. Mullan

Joined the lab in 1929, as a storekeeper in the spinning section. Deputed to Ordinance office at Sewree on August 2, 1943. Retired on April 21, 1944.

Sri Guptaji

Was worked as a clerk in spinning.

Sri S.K. Redkar

Joined the laboratory on August 19, 1943. He worked as clerk/ storekeeper in spinning. Later, transferred to office side. Promoted as Assistant on December 1, 1961.

Sri Fr. Fernandez

Worked as clerk.

Sri M.P. Juwale

He was a store clerk. Transferred to office. Subsequently promoted to the senior posts and prior to retirement to the post of Superintendent. Took voluntary retirement on August 11, 1984.

Sri K.S. Joykutty

When I joined, he was working in spinning section as clerk/ store clerk. He went to USA in seek of a job and settled there.

Sri K.S. Deshpande

Joined the lab on June 1, 1965. He was a clerk and storekeeper in spinning section. Went to office side. Promoted as Superintendent. Retired on February 28, 1990.

Sri P.D. Sonawane B.A. (Spl); LL.B.

Joined as Jr. clerk on July 1, 1960. Also worked as storekeeper and clerk in Spinning section. Rose to the senior posts and by the time he was transferred to CIFT, Versova, Mumbai in 2003 as A.O.

Sri M.Z. Bhagat

Joined the lab on August 21, 1968. He worked as storekeeper and clerk in the spinning section. Transferred to office side and promoted to various senior posts later as Superintendent on January 15, 1994, and finally as A.A.O on October 30, 1998.

Smt. S.D. Salvi Bai

Joined the lab on May 4, 1977 as Jr. clerk. She worked as clerk in spinning section. After marriage, she changed her name as Smt Ambre. Got transferred to office side. Promoted as Sr. clerk on November 7, 1987.

Sri H.G. Kini

He worked as stores clerk for few months. He was transferred to office but resigned the post on

February 11, 1983.

Sri D.G. Kulkarni

Joined the lab on April1 4, 1972 as Lab boy. Transferred to spinning section; he was attending the duties of stores. He was transferred to office. Promoted as Sr. clerk on October 1, 1985.

Sri D.J. Raut

He worked for some time in spinning section. Transferred to office side. Promoted to the post of Assistant and took volunteer retirement on May 17, 1986 to join his family business.

Sri S. N. Salve

Joined the Lab on January 3, 1977 as Jr. clerk. He was sent to MPD. He was attending the work of the store, in the spinning section. He was transferred to the office side. Promoted as a Sr. Clerk on June 29, 1985.

Sri K.W. Khamkar. B.A;

Joined the Lab on May 1, 1974 as Lower division clerk. He was attending the work of storekeeper / clerk. Promoted to the post of Assistant on November 7, 1987. Very good athlete. He represented CTRL in ICAR games. promoted to the post of AAO, on 21st April 2003.

Sri J.R. Mangle B.Com;

Joined the lab on November 20, 1986. He worked in spinning section as a stores clerk.

Sri E.T. Gurav

Joined the Institute on December 15, 1978. He worked as clerk/ storekeeper. Became Junior clerk on May 28, 1983. He was hospitalized and expired on May 3, 2000 (He was in the grade of UDC).

Sri A.B. Dalvi

Joined the Institute on April 4, 1972 as a lab boy. (Inter Arts). He was transferred to spinning section working as stores clerk. Promoted as Sr. clerk on April 1, 1984.

Sri V.M. Kasbe

He worked for a small period in spinning section. Later transferred to Office. He was promoted as Assistant. He was hospitalized for chest pain and expired on October 11, 1987.

Sri N.V. Kambli

Joined the Lab on September 2, 1983 in S.S.Gr.1. Promoted to the post of Jr. clerk on November 7, 1987. Deputed to spinning section. He was in the spinning section as stores clerk and worked for few moths. Later transferred to Office.

Sri S.S. Angane

Joined the Institute on April 29, 1987. (UPTO HSC), in the grade of SS.Gr.I (watchman) Worked for some time in spinning section. Later went to office side and promoted as junior clerk on April 1, 1993.

Chi. Sow. Megha

She worked as temporary stores clerk for few months.

Sri S.N. Bandre

Joined the Institute on July 17, 1990 in the grade of SS.Gr.1. (Up to HSC) Before coming to MPD he was working as telephone operator. He learned to work in Blow- room, carding, draw frame. He was assisting the store keeper clerk, whenever is needed.

Sri S.G. Shinde

He was a machine operator. Since the office did not provide a clerk, he was managing the duties of both.

Smt. U.N. Bhandari

Joined as Jr. Stenographer on June 20, 1988. (H.S.C). She was transferred to Knitting section for few months.

Workshop people who supported all these years:

Date of Joining	Name of the Person.	Date Of leaving
1924	K.S. Venkatraman, Electrician,(Govt. Tech. Board, exam.1921,) B.E.S & Tramways Co;	1927-28
1928 (Aug)	Herculano Lobo, LEE, Electrician	1945-46
01-08-1944	H.V. Thamankar, LME, LEE ; Joined as Draughtsman, by the time of retirement, he was T-7	1981 (Ret.)
21-09-1955	H B. Thambe, Pump operator cum Plumber T-1-3	Ret. 1998
25-01-1956	M.M. Sheikh, (VII) Mechanic, T-II-3, 30-11-84	28-02-1990.(Ret)
19-03-1956	R.K. Landge, (IXth) Lab boy, T-I-3, 01-07-1977	01-06-1994 (V.R) 16-10-2003(Exp)
1964	Rama Mohan Rao, Research Assistant	25-11-1964 (Res)
20-5-1957	R.B. Pawar, (IXth), Wireman. T-1-3	31-03-1990 Ret
12-06-1963	D.V. Kambli, T-2-3, Senior Assistant	31-01-2002
04-05-1964	P.B.Gurjar, SSC, Draughtsman	(Ret). 30-11-2000
17-05-1965	R. Sethuraman, R.A.	1967 (Res)
12-10-1966	S.G. Dalvi, Wireman, now in the grade of T-5.	
02-09-1972	G.D. Narkar, Carpenter	Exp. May 2002
14-07-1975	D.L. Upadhye, Machine Op, now in the grade of T-5	
08-03-1972	A. Kalimuthu, B.Sc. (Ele) S.R.A	08-06-1974 (V.R)
1942	S.N. Salvi Boiler attendant T-1-3	30-06-1980 (Ret)
1977	Itnare, Electrician Gr.2	15-03-1981 (V.R)
19-07-1975	M. Kunchi Kannan Menon, Electrical Foreman, D.E.E	01-04-1978 (V.R)
16-11-1970	Kshirsagar, A.C. Operator, Retired as T-5	30-04-2003 (Ret)
26-02-1990	P.N. Sahane, (XIth, Science, D.T.E), T.A.	
10-12-1980	M.Z. Rathi Gr. I, Safaiwala.	
02-11-1981	H.U. Gangar B.E (Ele), Grad. IETE; T-6, Ph.D.; T-(7-8)	
04-08-1983	K. Natarajan T-4, Repatriated to CPWD, Bombay.	Tr. 24-04-1984
25-07-1960	P.G. Kadam, Lab boy, He was a peon for several years in Chemistry section. Later transferred to workshop. (T-2)	Exp. 10-12-1998
1978	K.R. Chawhan, Wire man T-1	23-02-1980 (Res).

03-03-1979	O.T. Thapa SS.Gr.1	
06-11-1987	A. Venugopal B.E; T-4, Promoted to T-5.	
03-03-1987	Shivgan SS. Gr.1, H.S.C T-1-3	
23-11-1977	C.N. Mayavanshi Gr.2 (VII) SS.Gr.I. Transferred from CICR, Nagpur from 15-2-89.	
25-05-1992	V.N. Borkar T-1-3,T-2-3	22-09-2000 (Res.)
18-09-1991	D.M. Correah T-1 SSC, ITI;	
31-03-1990	N.D. Walzhade Gr. I (IX)	Exp. 02-11-1998
01-04-1981	A.A. Gote, Electrician T-1, Promoted to T-2	Res. 30-07-1983
17-04-2003	N .K. Shaikh, (SSC) ITI-Certificate. T-1	

Ginning staff members who supported spinning:

Date of Joining	**Name of Person**	**Date Of leaving**
28-12-1940	G.G. Oka, Joined as Ginning supervisor	01-04-1949 (Ret)
01-12-1949	D.G. Shetye, G. Supervisor. T-6	31-03-1979 (Ret)
02-09-1957	A.R.S. Abdulla, Gin fitter. T-1-3	10-08-1982 (Exp)
20-12-1965	S.V. Patil, Peon, T-2, on 23-11-1999.	
1970	Sonkaria S.R.A, Transferred to Delhi.	01-08-1974
22-05-1985	Vijayan Iyer, A.M.I.E; (T-4) T-5	10-02-1998 (Res)
30-01-1984	Dr. Anap, M.Sc; S-2 Senior scientist	01-09-1998 (V.R)
10-01-1983	Mohsin khan Abdul Rashid, SS Gr.I Nagpur.	
11-09-1978	Dr.Vizia S-1 PhD; Principal Scientist,	31/10/2002 (Ret)
02-12-1974	Dr. S.B. Jadhav, M.Sc; Res. Assist. (Scientist)	
14-09-2001	Ashok Kumar Bharimalla, Scientist, M.Tech (Ag,. Engg.)	

Important dates in the history of cotton: Source: Cotton cultivation and Fertilization By. Dr. G.Muller.

3000-2700 B.C.	Cotton fabric found in silver vase during excavations at Mohenjo Daro
2578-2370 B.C.	Textile and cotton yarns discovered in pre-ceramic finds at Huerta Prieta
Indefinite	Cotton fabric and fans from Pueblo ruins, Arizona.
Indefinite	Cotton used as stuffing for mummies found in tombs excavated at Ancon near Lima. Pre-Inca tombs found in Peru with looms similar to those used in India.
1500-1400 B.C.	Hymns of Rigveda provide first literary proof of cotton.
555 B.C.	Cotton found in the Nile valley
500-300 B.C.	Cotton grown in kingdom of Weroe of Sudan.
448 B.C.	Herodotus writes of cotton in India.
400-300 B.C.	Reports on cotton culture in India and Arabia.
333 B.C.	News of cotton reaches Western Hemisphere through Alexander's campaigns; Theophrastus writes of culture in India and Tylos (Bahrein islands)
70 A.D.	Pliny reports cotton plants in Egypt.
100 A.D.	Joseph mentions cotton plant in Palestine
799 A.D.	An Indian priest shipwrecked at Mikawa introduces cottonseed to Japan
827 A.D.	Arabs bring cotton planting to Sicily
900-1000 A.D.	Arabs bring cotton planting to Spain
1100 A.D.	Buddhist monks bring cotton planting to China and Japan. Probably known much earlier.
1300-1400 A.D.	Cotton goods from India brought by Arab traders to Venice, subsequently Imported via Bremen to Leipzig, Breslau and Bavaria.
1430 A.D.	First reports of cotton trade with England.
1492 A.D.	Landing on Guanahani island (San Salvador) Columbus is offered gift of Cotton by natives; Aztecs of Mexico and Mayas of Central America practice weaving and dyeing of excellent fabrics; cotton strips also used as currency.

1550 A.D.	Japanese cotton reaches Australia
1555 A.D.	Cotton and sugar culture in Brazil.
1570 A.D.	Brazilian cotton marketed at Ulm (Germany).
1583 A.D.	64 arrobas (736 kg) of cotton reach England from San Domingo.
1590 A.D.	Cotton fabrics from Guinea arrive in London. Principal wool supplies to Europe (and reputedly to Egypt until 1792) come mainly from Smyrna, Cyprus, East India and the Levant
1608 A.D.	Indian calico imported to Holland.
1621 A.D.	First attempts made to grow cotton in Virginia.
1711 A.D.	200,000 lb of cotton exported from Alexandria to Marseilles.
1733 A.D.	Cotton first planted in Carolina, one year later in Georgia
1744 A.D.	Cotton goods first manufactured in Berlin
1767 A.D.	James Hargreaves invents his spinning machine
1781 A.D.	Cotton first imported from Brazil to Liverpool
1784 A.D.	14 bales of U.S. Cotton reach Liverpool
1786 A.D.	Edmund Cartwright invents the power loom
1787 A.D.	Large scale imports from Georgia to Liverpool, increasing after the invention of the ginning machine
1793 A.D.	Invention of ginning machine by Eli Whitney.
1787 A.D.	First mill established at Beverley, Massachusetts
1788 A.D.	G. Barbadense imported from Bahamas to Georgia
1790 A.D.	Hybridization and crossing first conducted and described by Von Rohr on Super technology Pvt. Ltd. Croix island.
1793 A.D.	Ginning machine invented by Eli Whitney
1796 A.D.	Saw-ginned machine invented by Holmes.
1798 A.D.	Cotton growing near Thebes reported during Napoleonic campaign in Egypt.

1810 A.D.	In the garden of Mako Bey, near Cairo, Jumel discovers cotton of exceptionally Good fibre, origin of Egyptian quality cotton.
1840 A.D.	East India company imports American cotton varieties to India
1861-1865 A.D.	American Civil War interrupts American cotton exports and decisively affects Cotton culture in USA and other countries
1898 A.D.	USDA (Webber) begins systematic cotton breeding on scientific basis; experiments with *Sea island* later extended to *upland* cotton.
1902 A.D.	Egyptian cotton varieties imported to USA

American Cotton Scenario: Fabric of Time Sponsored by Dunavant Enterprises Inc; Scroll through 700 years in the evolution of American Cotton production:

1300 A.D.	Cliff dwellers in New Mexico grew cotton.
1492	Columbus discovers cotton growing in Bahamas.
1556	Cotton planted in Florida.
1607	Virginia colonists plant the first cotton crop
1722	First roller gin in operation in Mississippi.
1734	Georgia plants first cotton crop
1742	Durbreuil invents roller type cotton gin in Louisiana.
1745	Spanish missionaries in Texas grow cotton.
1786	Sea island cotton introduced from West Indies.
1787	First US cotton mill established in Massachusetts.
1793	Eli Whitney invents cotton gin
1796	Cotton cultivation at Spanish missionaries in Colorado
1806	Mexican hybrid cotton introduced.
1813	First successful southern textile mill begins operation in north Carolina
1814	First cotton seed huller patented
1817	Mississippi river steamboats begin carrying cotton.
1845	Cotton falls to lowest price ever 5c/pound.

1850	Mule drawn cotton picker patented. Strauss creates cotton Levi Jeans. First patent issued for a cotton picker- that did not work
1854	Mormons found cotton growing settlement in Utah later build textile Mill
1857	Combined gin- spinning machine patented.
1862	Cotton harvested in the San Joaquin valley of California.
1870	New York cotton exchange established.
1875	Invention of machine for stripping cotton.
1879	Thomas Alva Edison uses cotton thread in inventing electric light
1892	Boll weevils enter US from Mexico.
1903	Cotton covers wings of Wright brothers' air plane
1906	Nation's first extension service demonstration held on a Texas farm
1908	First cotton crop planted in the Imperial valley of California
1916	Pink boll worm enters US
1926	Arkansas farmer initiates the use of insect scouts
1927	John Rust announces moistened -spindle method of mechanical harvesting
1930	Storm proof cotton strain discovered. USDA establishes ginning labs
1937	National cotton council organized.
1938	First application of defoliant.
1946	First Micronaire machine developed to measure fibre fineness
1947	Cotton becomes California's most valuable field crop. The first Beltwide cotton mechanization conference is held by The National Cotton Council
1955	Chemical weed control begins. NCC establishes the cotton foundation
1956	The Suez canal crisis of 1956 gives birth to container transportation
1964	One price system for US cotton is established. First forward contract of cotton acreage between merchant and Producer. First post war catalog sale of ICCC surplus stocks of Upland cotton.
1968	The first High volume instrument lines installed
1970	Formation of cotton incorporated.
1972	First sale of US cotton to the peoples' Republic of China
1974	World oil crisis

1975	ACSA coordinates US cotton industry and the US government forces and avoids massive lay downs by foreign mills on contracts with US exporters. ACSA, LCA. JCTA form CICCA to enforce contract sanctioning.
1977	A trial Boll Weevil eradication program in Virginia and North Carolina is expanded to other cotton belt regions.
1986	Marketing loan concept incorporated into the farm bill and Implemented
1988	The NCC's cotton physiology education program begins
1994	Cotton harvest tops 19.6 million bales, the largest crop in US history
1995	Transgenic, insect – resistant varieties are introduced commercially.
1997	The industry develops a permanent bale identification system
1999	Process ginning becomes commercially available.

Cotton Scenario in Australia

1788	Cotton introduced in Australia
1830	First export shipment of 3 bags of cotton to England.
1857	Small quantity of rain grown cotton in Queens land.
1861-1865	American civil war helped to grow cotton in Australia.
1871	peak production in Australia ,but fell away as world cotton prices declined.
1925	Government subsidy introduced to promote cotton production in central Qeensland.
1926	Qeensland cotton marketing board setup.
1934	17,000 bales production
1954	Cotton industry almost non-existent.

1958	' Keep it ' dam completed on the Namoi river, providing irrigation water to the Namoi valley.
1960	Limited irrigated cotton production in South west Qeensland.
1961	A commercial crop planted at Wee Waa irrigated from Keepit dam..
1963	A bounty on raw cotton introduced to encourage expansion of the industry. Cotton production begins on the Ord river irrigation scheme in Western Australia Kimberley region.
1966	Cotton established in the Macquarie valley following completion of the Burrendong Dam. Cotton production begins also at Bourke.
1968	Emerald irrigation area established first exportable surplus production
1971	Raw cotton bounty removed at the request of the industry. Cotton production of 87,000 bales.
1973	Cotton production on the Ord river scheme ceases, mainly due to the resistance of insects to pesticides.
1975	Cotton production of 110,000 bales.
1976	Cotton established in Gwydir valley at Moree using water from newly construed Copeton dam.
1977	The Construction of the Pindari and Glenlyon dams allows cotton to be grown in the Macintyre valley.
1980	4,35,000 bales produced.
1985	Cotton production reaches 1.1 million bales.
1992	World record yields lead to record harvest of 2.2 million bales.
1995	Harvest falls to 1.5 million bales because of drought
1997	Forecast record harvest of 2.5 million bales."

Synonyms of Cotton

Collection by Dr. A.N. Gulati, ICCC, CTRL, Bombay-19

' 5o years of Research' - Dr. V. Sundaram

Name (Used)	Language	Name (Used)	Language
1 Karpasa, Puttika, Pottaka, Picu, Dukula, Tula	Sanskrit	19 Pariti	Tamil
2 Le cotton	French	20 Hatti, Arale	Kannada
3 il Cotone	Italian	21 Rui	Hindi
4 Algodon	Spanish	22 Ru	Gujarathi
5 Kotunia	Roumanian	23 Run	Punjabi
6 Kotnja	Russian	24 Panjin	Tamil, Malayalam
7 Ku-cun, Kudzun,Kutun, Po-tie	Chinese	25 Seduga	Prakrit
8 Chethon, Kirbas, othonium	Hebrew	26 Tula	Bengali
9 Gapas	Phillipine	27 Manua	Uttar pradesh
10 Bazac	Palestine	28 Wa-gye, Wa-gale, Wa-beih	Burmese
11 Pakhta, Panba	Persian	29 Bazuzulu, Owu	West -African
12 Kapas, Kopas, Kupa, Kupaih, Hapas, Kopal, Kape	Indonesian langs.	30 Hont, Tut	Abyssinian
13 Gossypium	Latin	31 Konku	Central Africa
14 Xylon, Carbasos	Greek	32 Lado	Senegal
15 Kapas	Hindi, Gujarathi, Rade, Malayan, & Javanese.	33 Amanya	Gaurani(S. Ame Lan of Buenos Aires.
16 Kapah, Phutti	Punjabi, Sindhi	34 Icpatl	Aztec
17 Kapus	Marathi	35 Uchu	Quechua
18 Patti, Aekina Dordi.	Telugu		

Lea strength standards fixed during the period:

1924-26		1967			
Cts	CSP	Cts	CSP	Cts	CSP
14s	1260	14s	1512	44s	1708
16s	1296	16s	1526	50s	1750
18s	1314	18s	1540	60s	1820
20s	1340	20s	1554	70s	1890
22s	1364	22s	1569	80s	1960
24s	1392	24s	1552	90s	2030
26s	1404	26s	1596	100s	2100
28s	1428	28s	1638	120s	2240
30	1440				
32	1472				
34s	1496	34s	1652		
36s	1512	36s	1666		
38s	1520	38s	1680		
40s	1560	40s	1685		

The revision in the CSP standards were being updated as and when the machines were up-dated in the spinning division.

Viz: 1) 8 (C+ 200) in 1977 2) 8.5 (C + 200) in 1982 3) 9.2 (C + 200) in 1999

Annual Report of the Laboratory (1923)

Technologist's duty:

1. He should help the agricultural departments to arrive at a correct judgment of the values of any new variety of cotton produced.
2. He should also undertake other lines of research relating to cotton; such as an investigation into the differences between the fibres of American and Indian yarns.
3. He should also be able to value different varieties of cotton in such a way as to bring out clearly the real value of staple and of definite increases in its length.

Standard Indian Cottons: (1924)

1. Kumpta	Dharwar 1
2. Dharwar- American	Gadag 1
3. Surat 1027 (A.L.F)	
4. Punjab American	285 F
5. Punjab American	289 F
6 . K- 22	
7. Cambodia	295
8. Northerns	Sircar No.14
9. Westerns	Sircar No.25

Modernization of Technological Laboratory/ CTRL/CIRCOT over the years:

During the 1920s, the textile science was beginning to take shape. Even the other Engineering branches were in their infancy. Textile education had begun partially in U.K, some of the European countries,USA and India. In Bombay, VJTI started in 1888, at Byculla, and later shifted to their own building at Matunga, very near to the Technological Laboratory in 1923. Plant breeding science had just begun. Even The prestigious Shirley Institute at Manchester was established only during 1919, and started functioning in 1922-23. Under this backdrop, the Technological Laboratory was started at Bombay in 1924. The British government had put its heart and soul into the project of improving the quality of cottons needed for their textile industry. For this ambitious project, it provided the best infrastructure like building, machinery and the best scientific personnel to handle the project. Sir Bryce Burt Kt; CIE, MBE, the dynamic first Secretary of ICCC, took the lead in surveying the plot for constructing two buildings, one for experimental spinning plant and the other for a research laboratory. Bombay Improvement Trust sanctioned the plot in the pristine residential area, as per the recommendations of the Secretary. The Plans were approved, and in a record time, a single storey brick building was erected and was ready by the end of 1924. The Governor General, H.E.Viceroy, the Earl of Reading visited Bombay on 3rd December, and inaugurated the Spinning Laboratory. The prestigious _*Gate way of India* was opened for public the next day, 4th December, 1924. Such was the urgency and the importance given to the cotton improvement program.

The machinery manufactured in 1924 was transshipped immediately, installed in the same year and the spinning tests were conducted. Technological Laboratory was built on the similar lines of *unit principle* of Dr. Balls from Shirley Institute. Even the textile laboratory of VJTI, Matunga. also got similar guidelines. Obviously, all the machinery supplied to both of these pioneer institutes were the most modern ones. They were all made in Britain. Machinery to meet the requirements of the Bombay Textile Industries were also manufactured in Britan. All the equipments were installed by the British engineers.

The machines supplied to the Technological Laboratory were carding machines, drawing machines, the speed frames, the ring frames, and a Mule spinning machine with 194 spindles (see the plate on Page 24). There exists no writeup of using this machine for any of the studies. Due to the constraint of space, the Mule was donated to VJTI during 1934. Besides, Ring Frames were more innovative and most of the Bombay mills had placed orders for them.

The machinery consisted of a Porcupine Lattice Feeder, Crighton Opener, Hopper Feeder, and Scutcher. The lap was divided into 4 equal parts and fed to the scutcher. Machinery makers improved the designs over the years with a very slow pace. Some new machines like a new Horizontal Cleaner, new Hopper Feeder, 3 step core pulley, a new Cage Exhaust, new Cyclones, and improved Dust Trunks, with triangular vibrating grids and new type of blades. Machinery refitted with fast revolving cages, and exhaust fans, to eliminate dust and small impurities,

During 1930s, some conversions of drafting systems from 3 roller to Casablanca in speed frame and ring frame took place. With time space became very scarce. New land was purchased. The W.C. was shifted to the southwest corner of the spinning lab. Blowroom was extended by 30 ft.. Three rooms, at the cost of Rs.28,000, were built and the new machines were installed at the cost of Rs.9,000. The Single Roller Gin, the Double Roller Gin and a Saw Gin were placed in one of the

newly built rooms. The cost of these extra machines amounted to Rs. 40,000. The total amount spent on the modernization was Rs. 4 lakh. Sir T. Vijayaraghavachariar, Chairman of ICCC inaugurated the function on 29th May 1935. Due to socio economic reasons, further import of Spinning machinery was at a slow pace, although some of the testing machines were imported.

For nearly 4 decades, only two buildings were housing Ginning, Fibre Testing , Yarn Testing, Work-shop, in Spinning and Research buildings. Whole of the buildings were crowded and there was any space left for expansion. Dr. RLN Iyengar. Dr. B.L.Sethi, Secretary, ICCC, in consultation with Gupte, the Spinning master, got all the required machinery for spinning and testing instruments. A new 3-storied building was ready in 1964. Ginning section was shifted in 1965-66. FT/YT were shifted in 1967-68. In 1970 Workshop was shifted from the Research building. A new 7 storied building was ready in 1985-86, and the divisions like X-ray, Electron microscopy, Instrumentation, Micro biology, Chemistry, Technical information and Library, Administration, Accounts, Director's cabin and the Seminar hall, were moved. During 1999 -2000 the most modern Seminar hall (Jubilee hall) was built. A decent Guest house was ready in the year 2004-5 with Lift and other amenities.

First phase of modernization of Machinery started way back in 1966. The men who took the lead in installing the machines/ instruments are Shri. R.P.Neogi, during 1965-67, Shri. B.Srinathan, during 1968-91, and Shri. M.S.Parthasarathy during 1972-1994. Dr. V.Sundaram was the director up to 1988. The details are enumerated below:

Year	Details of the machines installed
1966	The imported Blow-room machines were available. The Platts blow room was installed consisting of Hopper Feeder, SRRL Opener, (Model 1200), Shirley Opener, Air stream cleaner (490 Type), MB-23 Single Scutcher lap former, with Kirschner beater.
1970	MMC Cards-4, from Calcutta, NMM Ring frames-3 from Kalwe, Thane. LR Draw frame- DO/2. For the first time, the lunch room for the operatives was arranged in a dust-free atmosphere. Earlier they sat near their machines and ate.
1974	Old Line shaft running all the machines was dismantled. Individual drives were provided. Obsolete ring frames, Reeling machines, Sliver lap, Ribbon lap machine, and Comber were discarded. The old T&S Blowroom was totally discarded and auctioned off. In fact, it fetched more money than what was spent 50 years ago. The new PLATTS Blowroom was inaugurated by the Union Agriculture Minister Sri. Jagjivan Ram, under the Golden Jubilee celebration of CTRL.
1976	LR Speed frame –GS, LR Ring frame-DJ/5, The top roller weighing was Pneumatic system. Wall Cup Boards were provided to store the Bulk and Research samples. The wooden cupboards were inadequate and could not be fixed on walls. Utilization of the space area became a big issue.
1978	LR Sliver Lap former-E2/4a, LR Comber-E7/4, PS Metler High speed Cone/Cheese winder. Tube lights were provided. Previously North Light was the only source of light. Since the light was insufficient, older operatives , especially in ring frames, were finding extreme hard ship, while mending yarn breaks.
1979	Rotor spinning machine was installed .This was a German made Laboratory Model OE machine called "*Rieter Trainer.*" When it was in operation, a host of visitors used to come from Delhi Cloth Mills, Bombay Dyeing Mills, Bombay, Morarji Mills, Mumbai etc. to know the first hand details of the most modern spinning system.
1981	SDL Model Sliver Trash Analyzer. This was absolutely needed to assess the proportion of micro dust present in Drawing Sliver. Beyond permissible limits, the rotor grooves were damaged by dust.

1982	Textool model Doubler/Winder. The Ginning machines were shifted to GTC Nagpur, and the same place was made ready for installing the Knitting and Weaving machines. Few Gins were retained for the use of the laboratory at Mumbai.
1983	TAIRO Model Card, Draw frame, Speed frame and a Unispinner (All Miniature Models used for processing small size samples
1986	USTER CLASSIMAT-2, Ring Doubler/Twister.(Textool) *For few years, several reputed mills used to send their personnel to get the first hand information about Uster Classimat-2, and our Reports were in great demand.*
1988	Bentley Komet Sock Knitting Machine. WMB 4 TD, Interlock Knitting Machine. CAMBER -" CHEMINIT, "Knitting Machine (Single Jersey)
1989	Computerized Lea testing machine (Star)
1998	Upgrade of the existing machines was very much needed because there was no effort in revamping the machines took place for nine years. The existing PK 211/E, Drafting systems were very ineffective and were immediately replaced by PK225 models. The level of Modernization required for our type of working, especially for Micro spinning system where very slow speed is needed up to the Ring frame stage, has to be taken into account. The desired accessories were not available for a long time. However, our maintenance of the machines was very satisfactory. This was the reason for retaining one of the oldest drafting systems on the Slubber machine for 74 years (Periodically, the top synthetics rollers were provided). Now SKF 1600-40, Model drafting system has been provided and the top rollers were fixed with Pneumatic weighing system, with the Inverter Drives. All the 80,000 plus samples are worked on this and associated machines!
1999	The Miniature drawing machines were also provided with Pneumatic weighting devices. This system assures a positive grip over the top rollers, and the amount of pressure can be optimized as per the fibres used like Polyester, Jute, Ramie etc or for the cotton blends.
2000	An additional Ring frame, and a Speed frame were added. The amount of Research activity on Blends increased manifold. With the effect, machine allocation for the cotton improvement scheme, some additional machines were badly needed.
2001	The inverter drives were provided since 1998 and now it is extended to some more machines. A Loom is added in the Knitting section to facilitate the weaving of our blended fabrics.
2002	Statex model Trash Separators were added. This is a better model for analyzing the samples and the micro dust levels also can be obtained. It is quick in operation. Statex Model Computerized Lea testing machine was added. The Star model was not functioning properly.
2003	TRITEX/CIRCOT Model Small scale spinning system was patented. The card, drawing, sliver to yarn ring frame, and a lab model rotor spinning machine, besides a regular lab model computerized ring frame. Whole requirements can be programmed. There is a demand from the private cotton traders, and textile educational institutes. VJTI purchased a set of machines for their research work. The unit is working satisfactorily.
2004	The R&D work is a on- going process. Maintenance and upkeeping is very much needed; besides, addition of modern machines are always needed if we want to be in the race! That is essentially what is being done at CIRCOT under the leadership of Dr. S. Srinivasan.

It is very appropriate to mention here that Sri. Muntazir Ahmed and Dr. S.K. Chattopadhyay were mainly responsible in modernizing the Mechanical Processing Division from 1995 and onwards (Since 1995 when Dr. KRK Iyer was the Director to the present with Dr. S. Srinivasan as the director). A number of dedicated officers, technical assistants and the operatives made it possible!

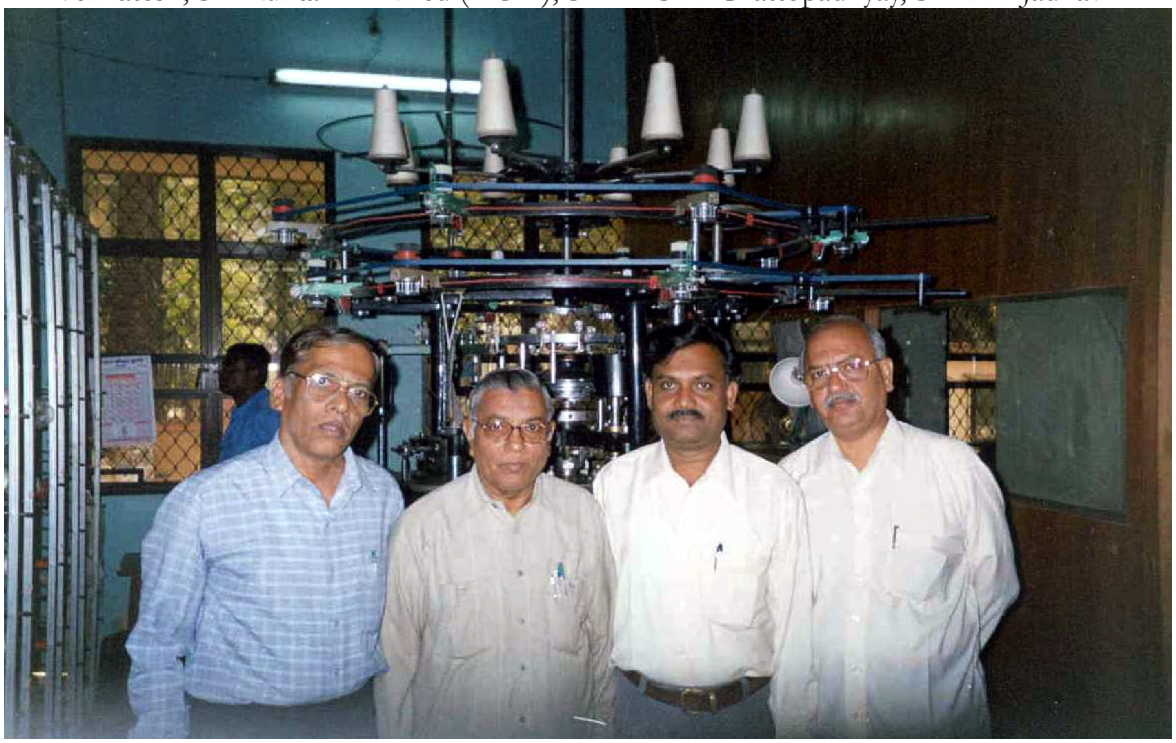
Spinning section from Northeast corner (2004)

Spinning section from Southeast corner (2004)

Blowroom (2004)

Carding Machine (2004)

In front of the main entrance of Mechanical Processing Division (2004)
Sitting : (From L to R), Sri A.K. Chaphekar, Sri A.P. Modak,
Standing (From L to R), Smt. Bindu Venugopal, Sri S. Chandrasekhar, Sri N. Shanmugam, Sri.H.R.L. Venkatesh, Sri Muntazir Ahmed (HOD), Sri Dr. S.K. Chattopadhyay, Sri R.K. Jadhav.



Behind circular knitting machine (2004)
Sri H.R.L. Venkatesh, Sri Muntazir Ahmed, Sri D.U. Kamble, Sri D.L. Upadhye

Glossary of some important technical terms in the breeding program

Back-cross: The cross of a hybrid to one of the parental types. The offspring of such a cross is referred to as the back-cross generation. Harland was a pioneer in applying this method to cotton crop. The method of back-crossing is best suited for transferring one or a few useful characters from another species or variety to an otherwise desirable cotton variety. Crosses between G.Hirsutum and G. Barbadense in the American group and between G. Herbaceum and G. Arboreum in the Asiatic group easily produce fertile hybrids. The back-cross method of breeding can be employed for transferring desirable characters from one specie to another within each group.

Cross-pollination: Transfer of pollen from an anther in a flower on one plant to the stigma in a flower on a different plant.

Culture: Experimental material under test.

Strain: A group, within a variety, which differs in one or more genetic factors from the main variety proper.

Type: An ideal representative of a group of plants with certain specific characteristics.

Variety: A sub-division of species. In breeding studies, variety refers to any introduction, reasonably pure breeding selection or standard variety included in the testing program.

Genome: A set of chromosomes inherited by an individual.

Genotypes: The fundamental hereditary constitution, Expressed and latent, of an organism.

Germ plasm: The sum total of hereditary materials in a species.

Hybrid: The first generation offspring of a cross between two individuals differing in one or more genes.

Line: A group of individuals from a common ancestry. A more narrowly defined group than a strain or variety.

Male-sterility: A condition in which pollen is absent or non- functional in flowering plants.

Mutant: An organism, which has acquired a heritable variation as a result of mutation.

Pure line: A strain, the individual members of which are descendants of one or more genetically similar individuals and are homozygous.

Quantitative character: That showing a continuous range in variability, masking separation into distinct classes difficult.

Recurrent parent or backcross parent: The parent of a hybrid with which it (the hybrid) is again crossed or with which it is repeatedly crossed.

Hybridization and selection:

This process increases genetic variability due to recommendations and new interactions of genetic factors. The plant breeders resort to hybridization for combining desirable characters from two or more varieties. Hybridization may be effected between different varieties belonging to the same or different species. It may be emphasized that for varietal improvement of cotton through hybridization it would be better to choose varieties within the same species of cotton and inter-specific crosses need be undertaken only for meeting special objectives. Exploitation of hybrid vigor in cotton has been engaging the attention of research workers for several years. Dr. C.T. Patel developed a hybrid known as hybrid–4 at Surat station. (Gujarath-67x American Nectariless), which had the yield of 80qtls /ha. Later in 1971, Dr. Katarki released another hybrid named Varalaxmi. –Hybrid seeds in the both the cases are being produced by hand emasculation and pollination which makes the seed production highly expensive.

Rogue: A variation from the standard type of a variety or strain.

Randomized block designs: the experimental design in which the varieties or treatments are allocated plots at random within each block or replicate.

Breeding methods: Breeding procedures designed for introduction of new germplasm, creation of variability and precision in selection have formed the scientific basis for cotton improvement in recent years.

New varieties: The introduction of new varieties constitutes one of the earliest and most rapid methods of crop improvement, as a complement to systematic breeding work. Based on climatic parallels, cotton varieties from similar agro-climatic areas can be obtained and studied for their performance in the new areas depending on their performance in the new areas depending on their performance for 2-3 years the best of the introduced varieties may be tested in the tract, seeds multiplied and distributed as an interim measure.

If the varieties possess genetic variability and are found to be heterogeneous on their first introduction, isolation of promising types by reselection would be possible.

Selection: Selection can be practiced in naturally variable local or introduced populations or in artificially raised hybrid progenies. In the several selection techniques adopted by the breed, it is necessary to assess the genetic component of variability as distinct from the environmental component. The merit of a selection is, therefore, to be evaluated on the performance of the progeny through statistically designed field tests.

Mass Selection: Earlier plant breeding scientists were practicing this system. Here, desirable plants, all having the same phenotypic characters both morphological and economic, are selected from

farmers' fields or from introduction plots. Such plants, which may be a few hundreds or more, are massed, ginned and the bulked seeds are sown next year. This process may be repeated if necessary, for 2-3 years till an improved bulk better in yield and quality than the original bulk is obtained.

Pedigree or individual plant selection: This can be practiced in introduced varieties or locally adapted commercial bulks depending on the variability present, or in the segregating generations of a cross.

In individual plant selection or pedigree selection, the progeny from each selected plant is grown separately keeping the identity of the parent and progeny intact. In the individual plant selection method, no attempt is made to select a large number of plants of similar appearance as in the case of mass selection but instead, a number of plants are selected based on their individual superiority. From each such selected plant, selfed seed is obtained for growing the progeny and in the case of desirable progenies, the cycle of selection, selfing and progeny testing is to be repeated, until a number of pure lines become available for testing against the local bulk. The replicated progeny row technique of Hutchinson and Panse (1937) can be utilized for the detection of residual genetic variability and isolating pure breeding lines. The best among the lines thus obtained is then released for distribution as an improved variety.

Secondary selection: The primarily selected individual plants, after undergoing progeny selection constitute the source of improved varieties. It has often been realised that there is scope for secondary selection or reselection even in such improved varieties due to various reasons.

Reselection within established varieties isolated through pure line breeding may not give spectacular results, but in the case of massed strains, the cycle of reselection may result in outstanding improvements.

Mass selection techniques like 'mass pedigree selection' of Harland (1949 a, b) and 'Sudan technique' of Knight and Rose (1954) are especially suitable to elevate a degenerating improved variety or for further improvement of a commercial crop of cotton and for building up varietal plasticity.

Hybridization and Selection: Hybridization increases genetic variability due to recombination and new interactions of genetic factors. The plant breeder resorts to hybridization for combining desirable characters from 2 or more varieties. Hybridization may be effected between different varieties belonging to the same or different species. It may be emphasized that for varietal improvement of cotton through hybridization it would be better to choose varieties within the same species of cotton and inter specific crosses need be undertaken only for meeting special objectives.

Pedigree method of selection: The individual plants selected from the segregating generation of the crosses are advanced to the replicated progeny row tests. The compact family block test, preliminary strain trial and main strain trial constitute the further stages of breeding under the pedigree selection method of handling hybrid derivatives.

Bulked progeny test system (Texas method): One of the major drawbacks of the progeny

selection method employing the pure line principle is that it results in too much homozygosity of strains. In commercial cotton varieties, a broad genetic base is desirable, so that it may suit wide environmental diversities and stand up to the hazards of adverse climatic conditions. While the method of pedigree selection based on pure line concept might be profitably utilized for breeding extra-long staple and fine linted cottons for specialized tracts, bulk methods of breeding designed to increase genetic plasticity of the strains may be usefully adopted in other breeding projects. The bulked progeny test system (Richmond, 1951) evolved at the Texas Agricultural Experiment Station to meet the needs of the wide range of soil and climatic conditions in Texas (USA) can be adopted for isolating genetically plastic strains.

Commonly asked questions about Transgenic Cottons:

Biotechnology – It has opened a new horizon in the cotton-breeding program in the shortest possible time!

1) What is the difference between Biotechnology and genetic engineering?

Biotechnology is a much broader term and involves utilization of living organisms for the improvement of living organisms. Bio-pesticides are biotech products, but they may or may not be, and mostly are not, genetically engineered.

Application of Biotechnology for crop improvement is comparatively new. Genetic engineering is a very specialized fundamental science as most of the research is in the private sector. Genetic engineering technology is one process used in biotechnology. Using the technique of 'gene splicing' or recombinant DNA technology ' (rDNA), scientists can add new genetic information to living organisms to form a new protein which may create new traits, such as immunity against insects or herbicide chemicals or even strengthen /improve existing traits. The technology for dealing with DNA has become so powerful that it is now routine to construct novel DNA molecules by joining sequences from quite different sources.

2). Transgenic cotton – genetically modified Organism or genetically engineered?

The right term should be used is genetically engineered (GE) cotton.

Cotton breeding scientists have achieved a lot in quality improvement over the years. Perhaps the length, fineness and strength parameters are predominantly witnessed in our lifetime. The other notable achievement is domesticating the perennial tree into an annual plant. In this process may be genetic changes have occurred, and the changes are being done to this day. Before recognizing genetics as a science, changes were brought without understanding the underlying science. **Now the**

process of variety development has become better understood, though not completely yet. The commercial cottons gone through drastic genetic modifications, and is continuously going through additional changes. The transgenic cottons of today have been developed through employment of a genetic engineering technique. The transgenic varieties that are formed already were genetically modified. But now they have been genetically engineered to emerge as transgenic varieties.

3) What is the difference between genetic engineering and Bt cotton?

Genetic engineering and Bt cotton are two separate things. As mentioned above genetic engineering is a process for producing transgenic products. Bt cotton is just one product, which has been developed through genetic engineering. **There is a need to recognize one as a process and the other as product.** The process may be good at all times; it could be employed to produce bad products.

4) Is all genetically engineered cotton a Bt cotton*?*

A gene from the soil bacterium **Bacillus thuringiensis** and inserting it into the cotton genome. The gene taken from the soil bacterium is coded as Cry1 Ac and now more genes from the same soil bacterium have been isolated and inserted into cotton to produce transgenic cotton like Bollgard *II. Thus, Bt refers to the source of the non-cotton gene in the transgenic varieties. If the source changes, as in the case of herbicide resistant cotton, it will no longer be a Bt cotton

5*)* **Are genetic engineering and conventional breeding complementary to each other?**

The processes used in the past to bring about changes in plants by combining all the characteristics of one plant with those of another were very slow. When the science of genetics emerged, breeders tried to understand how specific characters could be inserted together in the shortest possible time and without loosing other benefits of a selected genotype. As the understanding of cotton plant breeding grew, scientists found ways of speeding up the breeding process and making it more precise and reliable. It is now possible to identify (for many characters) exactly which genes are responsible for which traits and how they can be quickly and safely transferred to the target geno type. Using the information on genetic control on various characters, it is possible to make small and specific changes to a plant with out affecting it otherwise. The process is called backcrossing. The backcrossing process is still slow and has a number of problems, particularly the linkage between /among various characters and complex control of a particular character. Genetic engineering technology provides solutions to such problems.

Genetic engineering is just a small component of breeding. GE will permit the transfer of characters quickly and efficiently, create non-existing characters and create many more functions not even known yet in breeding. No doubt, the genetic engineering can perform functions extremely better than conventional breeding, and functions that are impossible with traditional approaches, but

the important role of conventional breeding cannot be eliminated. GE will always require breeders for screening the segregating material in the case of a new character and backcrossing in the case of transferring the existing unique gene to another variety. **Biotechnology is no different in breeding principles for developing a pure superior genotype and it will go together with conventional breeding.**

At this stage transgenic varieties have two functions, Control of bollworms and control of broad leaf weeds by over the top use of herbicides. There are certain scientifically realistic apprehensions about both effects. Bt cotton is effective against bollworms only, and the effectiveness varies by species of bollworms. It is apprehended that if a particular species of bollworms is vigorously controlled for a number of years, which the Bt cotton is meant to do effectively, some minor insects may become major insects. Not only this, but it is also feared that in this effort some insect species may emerge, which could be even more difficult to control with current insecticides. Similar apprehensions are also true for weeds. Broad leaf weeds are in general easier to control than narrow leaf weeds. If broad leaf weeds are eliminated through extensive use of herbicides on transgenic herbicide resistant cotton, some threats from grass weeds could become even more severe than broad leaf weeds.

As per the international service for the acquisition of agri-biotech applications, transgenic crops were planted on 52.6 million hectares in 2001/02. Out of 60 countries growing cotton in the world only 8 countries have approved transgenic cotton for commercial use. Among them resistant to insects are Argentina, Australia, China (mainland.) India, Indonesia Mexico, South America, and the USA.

During March 2002 Govt. of India, permitted commercialization of cotton. 2002/3 is the first crop. The herbicide resistant transgenic cotton alone and in stacked gene form, is allowed for commercial production only in Argentina, Australia and USA.

Outside the USA, insect resistant Bt cotton is more popular than herbicide resistant varieties. In the USA in 2001/02 varieties having the herbicide resistant gene, alone and in conjunction with the Bt gene were planted an over 97% of the transgenic cotton area, compared with less tan 3% of areas under Bt gene varieties.

Transgenic varieties are increasingly being used in vegetables, fruits and other oil seeds. The major claim being the resistant to pest control. As per the crops and varieties produced over 6 or 7 years there is no evidence of harmful effects anywhere. But the scientists are still skeptical about the long-term effects- just they say "they do not know" the effects. Unlike many other options available in plant protection, the genetic engineering technology is here to stay. Many pesticide products have been introduced in the past, some of which were abandoned even before they were commercialized. Some were used for a short period of time compared to others. The genetic engineering technology is above all of these. Genetic engineered products will come and go, but the technology to develop new products- genetic engineering – will stay and new products will continue to develop.

Source: ICAC Recorder, June 2002.

APPENDIX

Permanent Staff 1924-45

Years	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945
Technical Office staff	8	11	20	24	27	27	32	32	32	33	34	34	35	36	36	36	38	39	39	39	40	40
Research students	1	3	6	4	3	2	1	1	-	-	-	-	2	2	2	1	-	-	-	-	-	-
Fumigation chemists	-	-	2	4	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1
Total	9	14	28	32	32	31	35	35	34	35	36	36	39	40	40	39	40	41	41	41	42	41

Source: Annual Report year ending 31st May 1945. p.9

Years	24-25	25-26	26-27	27-28	28-29	29-30	30-31	31-32	32-33	33-34	34-35	35-36
Spg. Tests	7	19	19	22	21	63	92	60	87	121	112	135
Fibre test	1	1	5	1	7	4	7	19	30	18	19	44
Yarn Tests				1	4	4	2	3	5	3	7	13
Cloth Test												
Statistical Analysis												
Misc.												
Total Reports	8	20	24	24	32	71	101	82	122	142	138	192

Years	36-37	37-38	38-39	39-40	40-41	41-42	42-43	43-44	44-45	45-46	46-47	47-48
Sag. Tests	129	109	127	114	135	144	133	145	136			
Fibre test	52	32	35	42	32	59	29	43	49			
Yarn Tests	10	14	20	36	234	180	24	124	40			
Cloth Tests		25	69	69	624	821	42	67	101			
Statistical Analysis		3	3			24			3			
Misc.			1		1							
Total Reports	191	158	211	261	1046	1208	234					

Units of weights:-

Units	*Kgs*	*Pounds*	*Bales of 480 lbs Net.*
1 Long ton	1,016.04	2,240.00	4.666667
1 Short ton	907.18	2,000.00	4.166667
1 Metric ton	1,000.00	2,204.62	4.59295
1 Quintol (India)	100.00	220.46	0.459291
1 Quintol (Peru, Spain)	46.00	101.43	0.2113125
1 Quintol (Mexico)	46.03	101.47	0.21113958
1 Quintol (Argentina)	45.95	101.30	0.2110416
1 Metric Cantar (Egypt)	50.00	110.23	0.229645
1 Cantar (Sudan)	44.93	99.0493	0.206353
1 Maund (Pak)	37.31	82.2587	0.171372
1 Arroba (Brazil)	15.00	33.069	0.068894
1 Centner (USSR)	100.00	220.46	0.459292
1 Picul (China)	50.00	110.23	0.229645

Units of length:-

Units	Inches	Feet	Yard	Cms
1 Inch	1.0	0.083333	0.027778	2.54
1 Foot	12	1	0.333333	30.480
1 Yard	36	3	1	91.4401
1 Cm	0.3937	0.032808	0.010936	1.0

Units of Capacity:-

Units	Cu. Mts	Cu.Ft.	Cu.Yd.	Cu.Inches
1 Cu. Mtr.	1	35.31467	1.307951	61.02374
1.Cu.Ft.	0.0283168	1	0.037037	1.7280
1 Cu. Yd.	0.7645548	27	1	46,656.0
1 Cu.Inch	0.00016387	0.0005787	0.000021433	1

Units of area:

Units	Acres	Hectares	Feddans	Sq. Mts.
1 Acre	1	0.4046856	0.96334	4,046.856
1 Hectare	2.471054	1	2.38047	10,000
1 Feddan	1.03805	0.4200856	1	4,200.856
1 Sq. Mtr	0.0002471	0.0001	0.000238	1

Tables of coinage, weights and measures:

1 tola=180 grains. 11.66 gms.
1 chittak= 5 tolas= 900 grains, 58.32 gms.
1 seer= 16 chattaks= 2/2/35 lbs. 933.10 gms. 80 tolas.
1 maund= 40 seers= 82/2/7 lbs. 37.32 kg. = 3,200 tolas.

Khandesh:
3 maunds= 1 pulla, = 246.91 lbs.
1 lb= 38.88 tolas, 1 seer= 2/5/2 lbs.
1 candy= 784 lbs.

Berar:
1 maund= 28 lbs.
10 maunds= 1 boja= 280 lbs.
Central province:
80 tolas= 1 seer.

Pulgoan and Wardha:
11 seers= 1 maund = 22 /9/16 lbs.
15 maunds= 1 boja= 12/1/8 quarters.

Nagpur:
12 seers= 1 maund
14 maunds= 1 boja.

Barsi and Nizam's dominion:
12 seers = `1 maund
10.1/2 maunds= 1 boja, 259 ¼ lbs.

Karnatak (Kumpta)
25 pounds= 1 maund, 8 maunds= 1 atki= 200 lbs
Bagalkote:
25 pounds= 1 maund
12 maunds= 1 barmam= 300 lbs.

Dharwar/Gadag/ Hubli:
28 lbs= 1 maund, (1Qtl)
12 maund= 1 barman= 336 lbs.

The Weserns:
25 lbs= 1 maund, 12 maunds= 1Barmani boja.

Surat:
1 seer= 37.03 tolas. 40 seers= 1 maund
21 maunds= 1 candy = 800 lbs.

Broach:
40 seers= 1 maund, = 42/1/6 lbs.
21 maunds= 1 candy= 885 /3/4

Kathiawar and Wadhwan:
1 seer= 40 tolas, 40 seers = 1 maund, 41.15 lbs.

Bhawnagar and Dhulia:
40 tolas = 1 seer, 40 seers= 1 maund = 42/1/7 lbs.
24 maunds = 1 candy = 1001 /3/7 lbs,
Amreli and other places:
25 maunds = 1 candy = 1028 /4/5 lbs.

Bengal:
1 maunds = 104 lbs.
1 maund kapus = 82/2/7 lbs.
1 maund = 40 seers.(104 lbs.)
1 seer = 2.6 lbs.
Tinnavelly:
1 candy = 500 lbs.

English equivalents of Metric system:

English	Metric
1 acre (0.40 ha.)	
1 ton (40 cu.ft)	1.13 cu.mtr
1 gallon (4.5 Litres)	
1 English cu. Wt.=112 lbs avoirdupois	50.75 kgs.
1 lb	0.453 kg.
1 Ton	1016 kg.

1 pie = 0.093 d 1 Rupee = 16 annas 1s 6 d.
1 pice = 3 pies = 0.281 d 1 anna = 12 pies = 1. 125 d.
1 lakh = £7,500= Rs. 100, 000
1 crore = 100 lakhs = £750,000

Seed Multiplication

The purity of the seed is the most important factor. The breeding scientist produces the best available seed that has many traits required. The different stages of seed multiplication are listed broadly as below:

Nucleus seed	Foundation seed	Registered seed	Certified seed
For the best of strains undergoing district trials, a replicated seed neclues plot is simultaneously maintained by the breeder adopting the compact family block design. This ensures the maintenance of purity of the improved strain in final stages of trial. This nucleus plot is sown with single plants, possessing economic attributes conforming to the mean values for the strain. 10 sibs may be sown in single row plots of 5 dibbles each, replicated 10 times and maintained under selfing. When the improved variety is approved for multiplication and release, bulked seed of pedigree lines from the maintenance plots mentioned above, conforming to the mean values for economic attributes may be raised in a nucleus seed plot of half hectare. This nucleus plot may be maintained under isolation and should preferably not be selfed to promote gene exchange between closely related material.	Foundation seed constitutes the next stage in seed multiplication work. The crop in this stage is raised from seed obtained from nucleus plot and is preferably grown at the Research station under the direct supervision of the breeder. No selfing is done at this stage. However, great attention is bestowed to field observations and removal of off-types. The foundation stock seed is then to be multiplied on the fields of select cotton –growers who would be known as registered seed producers. In some of the states, co-operative societies have taken up seed multiplication of registered and certified seed, which form the next stages of multiplication. purity is the main criterion and strict supervision is observed. The number of stages of multiplication depend on the total requirement for the seed of the improved variety.	The departmental staff inspects this crop periodically. The crop registering a purity of not less than 95% only is approved for procurement. As per the agreement between the seed growers, the cotton grower is bound to deliver the produce to the approved ginning factory. The ginning is done under the supervision of the departmental staff. The seed lots of different stages and varieties are also kept separately and adulteration and admixture during the various processes like drying, cleaning, bagging, etc; are strictly guarded. Samples are also drawn for conducting germination and purity tests. Usual standards are 80% germination and 95%purity. Seed lots approved after tests are packed into bags of definite weight with suitable labels to indicate the name of the ginning factory, lot numbers, etc.	The Registered and/or Certified seed is distributed for general cultivation either by the State departments of Agriculture or through the Co-operative Societies.

Taxonomy of the Cotton Plant

Plants have been classified into natural groups. This plant kingdom is broken into divisions, classes, orders, families, genera, species, subspecies, botanical varieties, or races. Cotton is a major fibre crop belonging to the genus *Gossypium*, which is classified under the tribe *Hibisceae* in the family *Malvaceae,* which constitutes a somewhat ill defined group of about 1,000 species incorporated under 50 genera. The genus *Gossypium* was first described by Linnaeus. It is a large and variable genus including several wild and cultivated species showing a wide range of morphological types and distinct genotpe differences. The study of Cotton Taxonomy and genetics, became a necessity during 1920. Cotton, being a major cash crop of agricultural produce, needed intensive study so that it could be better understood and exploited to the fullest extent. Mr. Denham, of Shirley Institute, reported for the first time that old world cultivated cottons have the haploid numbers of 13 chromosomes and the new world cultivated cottons have 26 haploid chromosomes numbers. The botanical study entitled *"The study of the evolution of Gossypium"* was undertaken by eminent scientists from different parts of the world, where cotton was cultivated or used. The list includes:

1) N.I. Vavilov,	5) A. Skovsted
2) G.S. Zaitzev	6) J .M. Webber
3) S.C. Harland	7) J.O. Beasley
4) T.H. Kearney	8) J.B. Hutchinson

The details of the studies performed, using cotton samples collected from the various parts of the world, by several scientists during nearly **5** decades are as follows:

The Karyotype of the old world cottons was studied by Baranov (1930), Skovsted (1933), concluded that the new world cottons are allotetraploids originating from a cross between two species with morphologically dissimilar and non-homologous sets of chromosomes. He also postulated that one of the chromosome genomes is from the cultivated old world species and the other probably from North American diploids.

1) Skovsted (1935-1937)	4) Iyengar (1943, 1944, 1944a, 1945,)	7) Menzel and Brown (1955)
2) Webber (1939)	5) Stephens (1945)	8) Gerstel (1953)
3) Beasley (1940-42)	6) Deodikar (1950)	9) Gerstel and Sarvella (1956)
		10) Phillips (1966)

The research work carried out by the above Scientists, have contributed to a great understanding of the cytology of cotton.

In *G. Barbadense*, Hutchinson et al. (1947) recognized *brasiliense* and *darwinii* besides the typical species. However, in Fryxell's (1969) classification of the genus, the variety darwinii has been assigned the status of a species as *G. Darwinii.*The species *G. Arboreum* has been divided into the following six

geographic races, viz. :

(i) soudanense	*(iii) burmanicum*	*(v) bengalense*
(ii) indicum	*(iv) cernuum*	*(vi) sinense*

The species G. Herbaceum has been divided into the following five geographic races. viz. :

(i) persicum	*(iii) acerifolium*	*(v) wightianum*
ii) kuljianum	*(iv) africanum*	

The new world species, *G. hirsutum* comprises **seven** geographic races, namely,

(i) *morrilli*	(iii) *palmeri,*	(v) *yucatenense*
(ii) *richmondii*	(iv*) punctatum*	(vi) *mariegalante*
		(vii*), latifolium*

Between *G. Herbaceum* and *G. Arboreum*, one translocation difference was recorded by Gerstel and Sarvella (1956). Abraham (1940) suggested a different origin for 6 chromosomes of *G. Arboreum* and *G. stocksii* based on the presence of only 7 homologues in their hybrids. Beasley (1942) divided the diploid species of *Gossypium* into 5 clear-cut genome classes as A Genome to cultivated Asiatic diploids, B to *anomala,* C to *sturtii* , D to American wilds and E to *stocksii* groups. Stephens (1949) suggested that the chromosomes of different species of *Gossypium* have manifold small scale structural differences that are not easily detected by cytological methods. Stebbins (1947) had termed those cases as cryptic structural differentiation. Gerstel (1953) and Menzel and Brown (1955) also reported gross structural differentiation existing between the A genome species.

Botanical status of true cottons:

Hutchinson and Santhanam (1974) summarized the origin of Indian cottons as follows:
Cotton textiles of Harappan civilization (2300-1750 B.C) were produced by sophisticated textile craftsman-ship. This clearly shows that there was sufficient evidence of cotton and related technologies in India.
Wild and weeding types have been seen associated with primitive cultivated types in both old world species, namely *G.Herbaceum* and *G. Arboreum.* Species *G. Herbaceum* have been found in the coastal strips, now of Karachi, through Northern Baluchistan to south Yemen, Ethiopia,. Sudan and even in West Africa and South of Sahara.
Species of *G. Arboreum* have been referred by Watt (1907) in Kathiawar (Gujarath) Khandesh and the Deccan areas. It seems likely that it was in Gujarat (India) or Northern Sindh (Pakistan), that *G. Arboreum* cottons were first brought into cultivation (Hutchinson 1971)
It may further surmised that the differentiation of the 3 perennial races of *G.Arboreum* namely *burmanicum* of North East India, *indicum* of western India and the peninsula and *sudanense* of North Africa, ante-dated domestication and that each contributed separately to the cultivation of cotton in Asia and Africa.

G.Barbadense and *G.Hirsutum* existed as distinct species in the wild in Central America and their cultivated derivatives were separately domesticated.
The lint bearing species of India.
Among the lint bearing species of genus *Gossypium,* the true cottons are **four**, of which the

Diploids (2n=26)/(Old World Cottons)	Tetraploids (2n= 52)/ (New World Cottons)
G.Arboreum, G.Herbaceum are indigenous to India and Africa, are popularly known as 'Desi' cottons.	G. Hirsutums and G. Barbadense were initially introduced to India during 17th and 18th century. The new world cottons are natural amphidiploids containing the A genome from a taxon of the Asiatic diploid group, and a D genome from the texon of the American diploid group. The new world cottons popularly known as the American (*G.Hirsutum*) and Egyptian (*G. Barbadense*) cottons.

Source: *Extracts taken from"Evolutionary Studies in World Crops" - Santhanam, V. Hutchinson, J.B.-1974 and "Hand book of Cotton in India" (1999) , V. Sundaram et al.*

Statistical Bale Weights for Cotton

(Latest from the Internet as on 31/01/2004)

(Data posted by *Cotton Outlook*)

Country	Weight of the bale (kgs)
Australia	227
Colombia	233
Mexico	220
Nigeria	185
Uganda	182
India/Pakistan	170
South Africa	200
Egypt	327 kg 720 lbs
Sudan	191 kg 420 lbs
Tanzania	181 kg 400 lbs
USA	218 kg 480 lbs

Articles by the author

Compact Spinning – The technology of the future

H. R. Laxmivenkatesh
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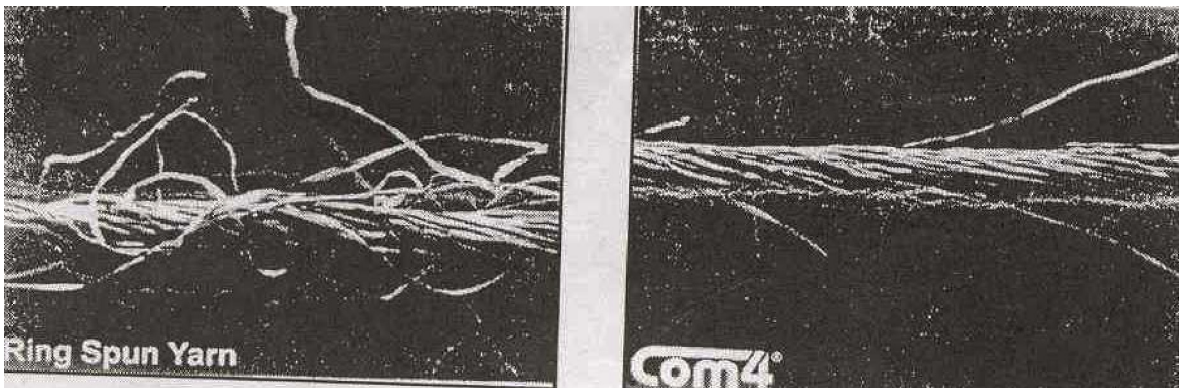

The ITMA '99 at Paris has unfolded the significant innovation of "Compact spinning" which is going to play a dominant role in the new millennium for a decade or two. The Rieter [1], one of the world's leading firm in building Ring spinning and Rotor spinning machines had clearly reported as early as in 1998, about their new venture in the Ring spinning field. All the leading machine builders of the world agree that the two best known yarn manufacturing methods at present, namely Ring spinning and Rotor spinning have attained optimum limits of their economic production and qualitative appeal, while not affording sufficient opportunity for 'creativity' in the design of specific yarn characteristics. Hence, the compact or condenser spinning [2] has emerged in a big way in a lightening speed, and the new yarn type is going to establish itself in addition to the conventional Ring and Rotor yarns in the textile industry of the future. The Compact spinning system is a variation on conventional Ring spinning and claims to produce distinctive, high quality yarns while the new Air Vortex spinning machine, shown by the Japanese firm, Muratec goes squarely for high production.

Major Builders:

There are 4 major machine builders in the fray. Namely:

1) Rieter, 2) Suessen 3) Zinser 4) Muratec.

First three have a common approach to the new technology. They are based on the addition of extra process action on the spinning machine, between final drafting and twist insertion, to push the staple fibre together – condensing them to achieve a much smaller spinning triangle than with conventional Ring frames. The result is that the fibre ends are much more tightly integrated into the fibre mass and the yarns, which are produced, have significantly different characteristics. smoothness and strength are claimed to be improved. But the Japanese manufacturer, Muratec uses the different technology. The system operates by producing a spiral of air, which is used to push the infeed sliver around a stationary

spindle to create twist and form the yarn. Since there are fewer moving parts, maintenance of spare consumption is reduced to the minimum.

The salient features of all the systems can be summarized as follows:

Table No. 1

Machine	Country	Model	Remarks
1. Rieter	Switzerland	Com4	Production of less hairy yarn. Yarn profile is excellent. Completely new characteristics of the Com4 yarns which are said to have a softer and silkier yarn.
2. Suessen	Germany	Elite	Suessen system based on existing Fiomax Ring spinning machines which are built on types 1000 and 2000 for short and long staple fibres respectively. Twist-to –strength ratio is also said to be substantially better, allowing lower twist levels (about 20% or less). Hence softer-handling yarns to be produced.
3. Zinser	Germany	AirCom Tex	Zinser is capable of producing long staple yarns. The yarns produced are less hairy and the yarn profile are excellent.
4. Muratec	Japan	MVS851 (vortex)	MVS best suited to the high-volume production of medium count yarns from carded cotton.

The Claims:

1. Rieters:

Feel the new route as an additional option alongside the existing Ring and Rotor spinning techniques. It's Com4 produced yarns are "setting new standards in downstream processing and wearing comforts, describing them as the 'yarns of the future'.

2. Suessen:

States that the new Spinning method can be used for all commonly used raw materials, including blends, across the entire Ring spinning count ranges. The company hopes that the new technology will have a major impact: 'In all relevant quality criteria. Genuine Condensed or Compact yarns are substantially superior to conventional Ring yarns. They hope that new innovation will add much to the existing spinning methods –Rotor and Ring spinning systems. Future belongs to Condenser or Compact spun yarns.

3. Zinser:

Zinzer have tried to optimize and enhance the yarn quality in the newly developed system. ' The main

targets are higher raw material yield and substantial reduction of the Hairiness.The optimized yarn character can be clearly seen in the end products.'

4. Muratec:

In case of Muratec, the leading Japanese machine builders, have gone much ahead of the three. In the sense they have already displayed a machine MVS type 851 at OTE.MAS exhibition at Japan in 1997. The present model is only an improved version of MVS851. Muratec claim to have developed " the first spinning machine to achieve knotless yarn with 100% cotton at a spinning speed of 400 mts/mt.

The MVS system utilises high speed spiral of compressed air is applied to the infeed draw frame sliver to form the yarn. The production rate is 20 times higher than Ring spinning and 3 times that of Rotor spinning. The method is claimed to give yarn characters that are quite similar to Ring yarn and highly versatile in quality parameters. The machine can produce medium-counts yarn from carded cotton yarns at a high speed of 400 mts/mt, besides producing quality yarns it has fully automatic piecing device which is unique among the other manufacturers at present.

The new systems offers:

1) The major claim from all the machine builders is reduction in hairiness of the material and also improvement in the yarn quality.
2) The need for yarn singeing is completely or partially eliminated.
3) T.P.I can be reduced while maintaining comparable strength to Ring yarn and providing higher production. If desired, twist levels can be increased to better elongation and strength, which will help to produce wide range of products.
4) Compact spun yarns can be used to replace two-ply items in some applications with resultant shortened processing and improved economics.
5) Combed Ring yarns can be replaced with carded compact yarns for some end use
6) Although the initial investment cost per spindle is much higher than the conventional Ring spinning, some aspects of the operating costs of compact spinning will be lower.
7) Since the yarn profile is very uniform and neat, ends down is minimum- the machine has reduced cleaning requirements.
8) Higher yarn yield can be achieved from a given quality of raw material yield, or lower quality raw material can be used to produce yarns of equivalent quality when compared with standard Ring spinning with the result the subsequent processes are made easy.

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(1950-2000)

CIRCOT- Micro Spinning System

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During 1930s, spinning of lint cotton was a much time consuming process, involving several machines in the sequence. The cotton breeding scientists around the world were looking for a suitable small scale spinning system so that their cotton trials in the early stages of selection could be spun which would help them in their selection process. The lint obtained was of very small quantity, sometimes from a single plant or from a few plants. It could not be subjected for full spinning. Fiber length was the only source of available data for comparing relative merits between the set of samples in their studies. Dr. Lawrence Balls was one such eminent scientist, who initiated the process of developing a small scale spinning plant along with his associates, Hancock and Underwood, which culminated in establishing the Shirley Miniature Spinning System. Even today we can see this system working in many leading mills of our country and around the world. Apart from this, the United States Department of Agriculture (USDA) has developed its own system for their requirement. Similarly, CIRCOT (earlier known as CTRL)[1] has evolved a small scale spinning system popularly known as 'CTRL Micro Spinning Technique[2] as early as in 1950. Since then, this system has been immensely helpful to the cotton-breeding scientists of our country. With the effort, several promising new varieties are being developed in our country. Incidentally, we are completing 50 years of useful service to the agricultural research and also to private cotton traders in and around the country. CIRCOT nostalgically remembers and salutes all the beneficiaries of micro spinning system, who showered their relentless faith in us all these years, and looks ahead still to attain greater heights in the coming future. It is highly appropriate to pay our humble tribute to Shri V.V. Gupte[3], then the spinning master, and also a reputed textile technologist, who pioneered this system by studying all the relevant parameters and demonstrated how simple and effective was his method to a country like ours. He was very practical in his approach and did not advocate any costly imported machinery and made use of the existing good old machinery like cards, drawing frames, speed frames, and also ring frames. With minor modifications they yielded excellent results. The details of the system can be discussed in the subsequent paragraphs [4]

The CIRCOT Micro Spinning Technique is capable of spinning yarn from cotton lint samples as small as 100 gms or even less! As discussed earlier, the method was used to screen the cotton breeders' trials by spinning their samples to a suitable count and ascertain the quality. The miniature machines installed at CIRCOT are very old. To name a few, the drawing and speed frames are as old as 75 years. Over the years, the system is being upgraded in a systematic manner. More recently, the top roller weighing system of the draw frame was replaced with pneumatic system, which assures positive grip with uniform load. Top roller pressure being 2 kg/cm2. The drafting zone in speed frame was converted to PK 1600-40 system. These old frames are eminently suitable for their smooth

functioning and the samples at this stage need to be run at very slow speed, hence retained to this date. The miniature ring frame (Make NMM) drafting zone is converted to SKF PK-225 drafting; earlier it was fitted with PK-211E model. Tin roller was fitted with split TR pulleys and the headstock gearing is replaced with helical drive wheels with ball bearings. New spindle inserts were fitted and wharve diameter is reduced to 7/8 inches from 1 inch. Micro samples can work from 10,800 rpm. Spindle speed to 13,000 rpm. Where ever possible, the inverter drive is incorporated viz: Drawing, Speed frame, Ring frame etc; CIRCOT Micro spinning procedure can be explained as under: -

The samples received from agricultural universities, or from private traders, come in 200-250 gms packets. They are required to be tested for fibre quality and also micro spinning. After taking the required quantity of lint for Micro spinning, the remaining amount is utilized for fibre test data. Small amount of cotton is required for repetition work; like a small quantity of cotton lint is lost while running at draw frame as roller lap up, and also if count variations are beyond permissible limits at Ring frame. We are expected to get nearly 16-20 leas for final testing. Keeping in view of all these points the sample size is fixed for various counts.

(Table 1)

Amount of lint required for various counts

Counts	Lint required in gms
16s	150
20s	100
30s	85
40s	65
50s	65
60s	65
80s	65
100s	65
120s	65

Usually samples are received in lots of 5, 10,15 or even up to 50, depending on the various field trials that are intended to be taken up. Each lot is specified for a particular experiment, like yield, fibre quality etc; the sample packets have to be opened carefully. Mix the lint by hand and remove seeds if any. This is very essential because the seeds get pressed against the cylinder and damage the wires. Now the samples are stapled out and the counts for which the samples are to be spun are estimated. This is very essential from the spinner's point of view.

The sample boards are to be prepared. The details like sample number, store number, nominal count etc; are written on the board with a wet chalk. The samples are weighed and placed on the black board and a thread is tied around them. Samples are stored in the polythene bags. Sample boards are retained through out, till the spinning stage is completed. These samples are stored serial wise in a cupboard, so that they can be taken for processing in the blow room on the same day, or a day after, as per the requirement.

Blowroom:

The samples are taken to Blowroom and placed on the table, fixed with wire mesh. Opening and cleaning is carried out by a 'hand bow', known as 'pinjari.' in the local language. Bringing the cotton into contact with the vibrating string, which is made up of catgut, opens lint samples. It has been found that the cotton responds well with such type of opening. The opened cotton is spread evenly on the brown paper and a lap is made with the dimension of 15-90 cms. The evenness of the lap depends on the skill of the operative, which ultimately helps to produce uniform sliver at card.

Carding machine:

The lap is fed to the carding machine over an inclined smooth stand, specially prepared for this purpose. The doffer speed is around 6-7 rpm. The other speeds like cylinder, and lickerin are not changed. The sliver produced will be very light. (May be in the order of 1 hank.) which is not suitable for processing on drawing machine. Hence the light sliver is divided exactly into 6 parts and fed to the coiler calender roller to get the desired hank sliver in the order of 0.1 to 0.21 hanks. During the carding process the fibre loss would be around 20 to 30 percent. Now, the whole sliver is weighed carefully and the sliver length can be taken with the help of the wrapping drum and the carding hank has to be calculated. The whole sliver is cut into 6 equal parts with the help of a wrapping block and the 6 ends are fed to the miniature drawing machine.

Drawing machine:

The drafts are fixed according to the final hank required and each sample is given 3 passages keeping the same draft in all the passages. Six ends are fed in all the three passages up to 40s count. For the counts above 50s to say 120s count, four ends are fed in the third passage. The length of the final passage of drawing is taken and hank is calculated. The roving hank can be fixed as per the counts that are going to be spun on the ring frame. The sliver is cut into 4 equal parts, so that we can produce 4 bobbins on the speed frame.

Miniature Speed frame:

The slivers thus prepared are fed to the Miniature speed frame fitted with PK 1600-40 drafting system and 4 bobbins are prepared from each sample. The details of the hanks for various counts are listed below. The machine is run with the speed of 650 rpm spindle speed. Please see Table- 2.

(Table –2)
Hank of Speed frame for Various counts

Counts	*Hank*
16s	0.90
20s	1.10
30s	1.10
40s	1.30
50s	1.80
60s	2.00
80s	2.80
100s	3.00
120s	3.20

Ring frame:

The speed frame bobbins are fed to the miniature ring frame fitted with the latest PK 225 drafting system. Suitable counts are spun with the standard twist multipliers. Spindle speed is maintained at 10,800 rpm Preliminary wrapping on two leas is taken (half lea from each bobbin) to the nearest of the nominal count and the machine can be started. Approximately 3 hours are taken for each sample. The details of TM for each count is given below in Table 3.

Table –3

Standard twist multipliers and lea csp

Values for different counts.
(Ring spun yarn.)

Counts	Proposed twist Multiplier	proposed lea CSP (csp=9.2(C+200)
Below 16s	4.80	1800
16s	4.60	1987
20s	4.60	2024
30s	4.50	2116
40s	4.50	2208
50s	4.50	2300
60s	4.20	2392
80s	4.00	2576
100s	3.90	2760
120s	3.80	2944

Testing:

The lea strength test are carried out on computerized lea strength tester, which has the facility of storing the data and also provided with a print command. Generally, 16-20 leas are available from each sample. Since the observed counts deviate from the nominal count, the corrected CSP is calculated as per CIRCOTs standards. Ten samples can be creeled at a time on the Miniature ring frame. All the samples in the set are compared for their lea CSP and also spinning performance etc. The success of micro spinning the State-of-the-art method, largely depends on the preparation of the hand prepared lap, and the piecing at drawing machine. Material handling at various levels is also playing a major role. CIRCOT, along with other research institutes like SITRA, BTRA etc; have tried to formulate prediction formulae for spinnability, by availing the various fibre parameters. But it has not been possible so far to establish hundred percent correlation with the fibre properties. Probably, it may be due to variation in some unmeasured properties like metal to fibre friction and torsional rigidity of fibres etc. While deciding the quality of a cotton, spinning value gives the reliable estimate and in fact, it is the acid test for a trader who wants to buy or sell his product! Hence, our main objective being, both spinnability and also spinning performance like; end breakage and yarn appearance etc; Ultimately, production and quality cannot be compromised at any cost!

CIRCOT has a pioneering role of helping the cotton-breeding scientists in selecting the improved strains year after year. The main functions of the Institute can be listed as below:

1. To carry out the fibre testing and also giving the spinnability of cotton initially by micro spinning and later by carrying out Bulk spinning trials.
2. To participate actively in the programs for improvement in the production and quality of cottons in India by evaluating the quality of new new strains evolved by agricultural scientists and giving them the necessary guidance.
3. To collect and disseminate technical information on cotton.
4. To investigate the greater and better utilization of cotton wastes, linters, cotton Seeds etc;

5. To carry out research investigations on the ginning problems of cotton.
6. To carry out research on physical, structural and chemical properties of cotton relation to quality and processing performance.

7. The samples that are considered to be promising in the micro spinning stages are passed to the bulk spinning trials and generally spun to two counts. The CSP obtained are compared with the standard CSP line and the HSC is found out. Cotton breeding program is a laborious process. It takes nearly 7-8 years to develop a suitable superior variety of the desired characteristics, in combination with economic yield. Let us examine how the spinning parameters are helpful in deciding the quality parameters. Here, Bulk-spinning trials are going to play a very significant role! In fact Bulk spinning closely resembles the mill spinning, the successful development of a new variety involves collaboration of scientists from various disciplines, viz. the cotton breeder, agronomist, physiologist, pathologist, entomologist and technologist. Hence, The all India co-ordinated cotton improvement project (AICCIP), started in April 1967. The project operates under the leadership of a Project coordinator, and research is carried out simultaneously in a coordinated manner on all the above aspects. Since the multiplication tests in each cotton growing zone, are carried out on the promising varieties the work of the evaluation of the new varieties as regards their yield, adaptability, duration, optimum agronomical and plant protection practices, quality etc; has been speeded up. The director of CIRCOT, being the principal investigator (technology) coordinates the technological evaluations. In this direction CIRCOT has done lot of work on various aspects of the quality parameters like ginning-outturn, fibre characteristics, spinning performance (Both Micro spinning and Bulk spinning) and also yarn quality. Already knitting section is working in full swing. Recently, a loom is also being added. The yarn can be utilized for making the fabrics.

   Data on the number of samples from different stages of trials tested annually at CIRCOT and its regional stations are given in Table 4:

Table 4 Quality Testing at CIRCOT

Sl.No.	Stages	*Samples tested annually*	*Number of Samples.*
I	*Breeders' material*: Screening of individual plant material.	Fibre tests at the Regional stations.	Over 15,000
II	*Preliminary trials* of Promising lines.	Fibre tests at the Regional stations /CIRCOT head quarters.	
III	*Preliminary Varietal trials for yield and quality.*	Fibre tests and Micro spinning at CIRCOT head quarters.	Over 2,000
IV	*Co-coordinated varietal trials.*	Fibre tests and Full spinning at CIRCOT head quarters.	Over 500
V	*Pre-release trials*	Fibre tests and Full spinning at CIRCOT and a Textile Mill.	About 10 for 3 consecutive years.

VI	*Post release trials :* A. Different stages Seed multiplication. B. *Standard cottons.* C. *Tade varieties.*	Fibre tests and Full spinning at CIRCOT head quarters.	About 150.

As the table reveals, in the stages I and II the lint available is very less. Hence, only fibre tests are conducted at regional stations (they are 9 at present). Most of the early trials are carried out for weeding out of progenies or lines having low yield and / or low quality.

During the preliminary varietal trials, where enough material is available, the fibre and Micro spinning tests are carried out at Mumbai. Here, the breeder gets a fair idea about the performance of his trials. CIRCOT has suggested norms for selection wherever necessary. The most promising among these are included in the final trials, such as the coordinated varietal trials, District trials. Pilot demonstration trials, etc;

The lint samples from these final trials are critically evaluated by subjecting them to detailed fibre and Full spinning tests for two or three seasons. The most promising trials are then tested in a Textile mill for two seasons to evaluate their performance under the mill conditions.
An ideal new variety should fulfill many characteristics viz.

1. Should perform better than the control variety in yield and fibre quality parameters.
2. A variety may be released for its specific qualities like it may be a disease resistant or a short duration crop, which helps to cultivate a second crop in the same field.
3. Ginning outturn should be better, etc;

CIRCOT Bulk spinning Technique:

It is interesting to know that how bulk spinning of CIRCOT resembles the mill spinning. As discussed earlier, the coordinated varietal trials are taken for Bulk spinning. At this stage the breeders are able to procure nearly 4.5 kg of cotton. This sample is subjected to the following procedure:

The lint sample is taken to the blow-room. As per the trash and the condition of the sample one can decide the number of cleaning points required. CIRCOT consists of a Platts blow room line, comprising of following machinery:

Blending Hopper Bale Opener, SRRL Opener (Model 1200), Shirley Opener or Air stream cleaner unit 490 type. MB-23 single Scutcher and Lap Machine with Kirschner Beater. The line consisting of SRRL Opener, Shirley beater combination is taken generally for trashy cottons, where more opening is needed. The Air Stream Beater is used for long stapled lint that requires less opening and cleaning. The laps are prepared on the Scutcher.

Carding machine:

The laps are fed to the MMC metallic carding machines. Recently, these cards are fitted with central trash sucking device and also an India roller is provided to transfer the carded web from doffer to callender roller. This system is very helpful for medium and short fibres.

Drawing:

Carded material is fed to the Lakshmi Rieter draw frame, which is provided with Polar drafting

system. Two passages are given here and the hank of the material is adjusted as per the requirement. Machine runs at 250 meters /min with 8 doublings.

Speed frame:

The finisher draw frame sliver is fed to the Textool/LR make can fed speed frame equipped with top arm double apron drafting system working at a spindle speed of 900 rpm. Usually, 11 to 12 bobbins are taken out from a single sample.

Ring frame:

These bobbins are fed to the SKF Ring frame fitted with PK 225 drafting system. The count range starts from 12s to 120s. The twists are adjusted as per the standards of CIRCOT. At least two suitable counts of yarn are decided to be spun, the counts being so chosen that the strength of one would be higher and of the other lower than the standard strength values for the respective counts adopted by the Institute. In other words, one count is under spun, and the other is over spun. The observed values of CSP are plotted against count on a graph paper on which the standard CSP values have also been plotted. The point of intersection of these two lines is taken as the optimum spinning quality of the cotton, and termed as " Highest standard count " (HSC). The HSC, represents only the highest count that can be spun from the given count with the given twist multiplier to give certain specified strength. The present standard CSP values expressed as a linear function of count can be obtained by the use of the following formula:

CSP = 9.2 (C+200)

The CSP standards are similar to Micro spun yarns, hence strength values are same as per the table no. 3.

Bulk spinning and Micro spinning are so much interrelated with each other in the cotton development program; it can said that one is complimentary to other. CIRCOT has carried out many studies, which are of considerable importance. The comparative studies conducted by Gupte and Nanjundaiah [1] by taking 55 cottons which were spun to 40s count on both the systems. Micro spun yarns found to be on an average 7% stronger than by Full spinning. The correlation coefficient between the yarn strength of the two systems are found to he 0.87, which is highly significant. Gupte [3] and Navkal studied 113 cottons, covering a very wide range of good quality Indian cottons. They were spun to 30s count by both the systems of spinning. It was noted that the correlation coefficient between lea strength of 30s spun by both the systems are 0.86. In detailed studies, they had divided 113 cottons into 4 groups according to the botanical species to which the cottons belong. The correlation coefficient as found to be highly significant in all cottons.

All the above studies were conducted at very early times – during the development stage of micro spinning. In later stages the system was moderately upgraded. However, it has been observed that micro spinning values are having an edge over the other systems. Anjane[5] conducted exclusive studies on all the four methods namely, CTRLs micro and bulk spinning, Shirley miniature spinning and the Mill spinning methods. All the four methods investigated in his studies were found to be highly correlated with one other in estimating the spinning quality of the of the cottons in terms of their lea CSP values. Yarns produced by mill spinning were found to be uniformly stronger than those produced by Shirley miniature spinning, the over all average increase being about 8%. over the latter.

The CSP values given by the two methods are very highly correlated. the correlation being 0.94, significant at 1% level. Yarns produced by CTRL (now CIRCOT) Micro spinning, on the other hand, were found to be stronger than the CTRL bulk spinning. However, average difference between the two of about 4.5% is considerably lower than the difference in CSP between Mill bulk spun yarns

and Shirley miniature-spun yarns. The lea CSP between the two systems is highly correlated. The correlation being 0.96, which is highly significant at 1% level.

From the above findings we can conclude that CIRCOT Micro spinning technique seems to provide an ideal solution for assessing spinnability, since it not necessary to buy any special equipment for the textile mill apart from a cheap 'Pinjari' bow for initial opening. (Lot of efforts are being made to design equipment for opening the lint, in place of hand bow is in progress.) It uses the conventional preparatory and spinning machinery with minor modifications and also gives the best results from the point of view of count strength product. Hence, CIRCOT [6] Micro spinning method is a means for exploring the limited quality parameter- CSP of lint samples, which is very urgently needed for a spinner/trader in a short span of time. *It's success lies in how judiciously one uses the system for one's requirements!*

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6 Technological Research of CIRCOT, since independence. (1947-1997)

ABBREVIATIONS

Degrees/Diplomas/Memberships/Honors

AIISc.	Associate of the Indian Institute of Science
AMIE	Associate Member of Institute of Engineers, Calcutta.
ARS	Agricultural Research Service
ATA	Associate of Textile Association, Mumbai
ATI	Associate of Textile Institute, Manchester
BCIRA	British Cotton Industries Research Association
BRRA	British Rayon Industries Research Association
B.Sc./BS	Bachelor of Science
CBE	Commander of the British Empire
CMG	Companion of (the order of) St. Michael & St. George. England
D.Sc.	Doctor of Science
DBM	Diploma in Business Management
DEE	Diploma in Electrical Engineering
DEIM	Diploma in Export Import Management
DIM	Diploma in Industrial Management
DPR	Diploma in Public Relations
DTT	Diploma in Textile Technology, SKSJTI, Bangalore
FNI	Fellow of National Institutes
FRIC	Fellow of Royal Institute of Chemistry, Great Britain
FRS	Fellow of the Royal Society.
FTA	Fellow of the Textile Association (Bombay)
FTI	Fellow of Textile Institute
LEE	Licentiate of Electrical Engineering
LME	Licentiate of Mechanical Engineering
LTI	Licentiate of Textile Institute, Manchester.
LTM	Licentiate of Textile Manufacture, VJTI, Mumbai
LTT	Licentiate of Textile Institute, SKSJTI, Bangalore.
M.Sc./MS	Master of Science
Ph.D.	Doctor of Philosophy
SRA	Senior Research Assistant
SSO	Senior Scientific Officer

Research Associations/ Educational Institutes/Projects

ACSA	American Cotton Shippers' Association. USA
AICCIP	All India Coordinated Cotton Improvement Project, Mumbai/ Nagpur/Coimbatore
AIFCSM	All India Federation of Cooperative Spinning Mills
BCGA	British Cotton Growing Association
BCIRA	British Cotton Industries' Research Association.
BISFA	Bureau International Pour la Standardisation des Fibres Artificielles
BRRA	British Rayon Research Association
BTRA/ATIRA/ NITRA/SITRA	Bombay Textile Research Association (Ahmedabad/North India/ South India Textile Research Association)
CCI	Cotton Corporation of India, Mumbai
CEN	Comité Européen de Normalisation
CICCA	Committee for International Co-operation between Cotton Associations
CICR	Central Institute for Cotton Research, Nagpur/Coimbarore /Sirsa
CIRCOT	Central Institute for Research on Cotton Technology, Mumbai (earlier called CTRL) Cotton Technological Research Laboratory in 1967, prior to this date it was called TL (1924).
CPWD	Central Public Works Department. (Govt. of India)
CRIJAF	Central Research Institute for Jute and Allied Fibres, Barrack Pore, (WB)
CRS	Cotton Research Station
CSIR	Council of Scientific and Industrial Research
CSWRI	Central Sheep & Wool Research Institute, Avikanagar, Rajastan
CTRL	Cotton Technological Research Laboratory
EICA	East India Cotton Association, Mumbai
FICCI	Federation of Indian Chambers of Commerce and Industry, Bombay
GAU	Gujarat Agricultural University
GTC	Ginning Training Center, Nagpur
HVI	High volume Instrument(for Measuring Cotton Quality Parameters)

IARI	Indian Agricultural Research Institute, Pusa, New Delhi
ICAC	International Cotton Advisory Committee (Washington)
ICAR	Indian Council of Agricultural Research, New Delhi
ICCC	Indian Central Cotton Committee, Mumbai (first organization to streamline the whole cotton research program in India)
ICRISAT	International Crops Research Institute for the Semi Arid Tropics
IFCATI	International Federation for Cotton and Allied Textile Industries
IFS	Indian Fibre Society
INSA	Indian National Science Academy
ISCI	Indian Society for Cotton Improvement
ISO	International Standard Organization
ITMA	International Textile Manufacturers' Association
IVRI	Indian Veterinary Research Institute. Ijatnagar
JCTA	Japan Cotton Traders' Association
JTRL	Jute Technological Research Laboratory, Calcutta
LCA	Liverpool Cotton Association ltd.
MAU	Marathwada Agricultural University
NABL	National Accreditation Board for testing & calibrating Laboratories.
NCC	National Cotton Council (USA)
NIFT	National Institute of Fashion Technology, Mumbai. (Now in all important cities)
NIRJAFT	National Institute of Research on Jute & Allied Fibre Technology, Calcutta.
OTEMAS	Osaka Textile Machinery Show. Japan.
PEPSU	Patiala and East Punjab States Union. (these states were formed in 1948 by the then Punjabi suba, constituting eight princely Punjabi speaking states.)
SDL	Shirley Development Ltd; (Testing Instruments made by Shirley Institute, UK)
Shirley Institute	situated at Manchester, est. in 1919. In 1988, it was known as BTTG. During April 2003, the name was changed to BTTG Ltd;
SKSJTI	Sri Krishnarajendra Silver Jubilee Technological Institute, Bangalore
SRRL	Southern Regional Research Laboratory. USA
TAIRO	Textile and Allied Industry's Research Organization. Baroda
TL	Technological Laboratory

TMC	Technology Mission on Cotton
UDCT	University Dept. of Chemical Technology, Bombay
UMIST-	University of Manchester Institute of Science and Technology
UNIDO	United Nations Industrial Development Organization
USDA	United States Department of Agriculture
UTMC	University Textile Manufacturing Committee
VJTI	Veer mata Jijabai Technical Institute, Mumbai
WIRA	Wool Industries' Research Association

CIRCOT-Some divisions and sections

Total number of divisions :-

1. TOTD- Transfer of Technology division
2. CBPD-Chemical and Bio-Chemical Processing Division
3. QEID-Quality Evaluation and Improvement. Physics, Textiles, XRD, XRFS;
4. MPD- Mechanical Processing Division. Spinning, Fabric quality, Warp/Weft Knitting

1) Administration 2) Finance/Ac officer, 3) ADM-I/II/III. 4) Test house 5) Technical Information/Library.

CIRCOT Regional Stations :

1. Coimbatore. 2. Dharwar 3. Guntur 4. Sirsa 5. GTC, Nagpur

Scientific post:

1. Scientist-S- Rs.8,000-13,500
2. Selection Gr.Rs.10,000-15,500
3. Scientist (Sr. Sc.) Rs. 12,000-16,200
4. Sr.Scientist Rs.12,000-18,300
5. Principal scientist Rs. 16,400-22,400

Technical grades:
T-1, T-2, T-3, T-II-3,T-4 to T-10.
Scale: T-7/8 are merged.
T-5 and onwards are called officers.

Auxiliary grades:
SS-grade 1, to S sgrade 4
The recruits are peons/ Hamals/ Malis etc;

Machines / Trade Names and Terminology

Blowroom	Blowroom is an indispensable set of machinery used in the cotton spinning system to open the tufts from the bale cotton and to clean it thoroughly so that the subsequent processes like carding become easy. Blending of fibres from natural with synthetic and between cottons and other new types of blends are done here. Present day blowrooms work on the same principle; but machines are less in the sequence. Electronics and computers are use in process control and the cleaning action is less severe without rupturing the good fibres.
Compact Spinning	Some innovation has been done on Ring Frame. Produces quality yarns. Ring spinning yarn produced on ring spinning frame for over 130 years, to this day!
Count	the fineness of the yarn(thread) is expressed in terms of counts. Typical English yarn count system: The number of 840 yards weighing in one pound of weight is called a Count. In other words, 80s count cotton yarn will have such 80 hanks of 840 yards in one pound of yarn. We can produce 67,200 yards of yarn from one pound of cotton lint!.
CSP	count of the yarn is found out and the tenacity can be ascertained by lea strength. The product is called CSP.
Ginning	The seeds are removed from the Kapas. Before that pre-cleaning is needed.
Ginning outturn	This is the quantity of available lint after ginning. Generally 35-40% Ginning outturn is recommended. 60-65% seeds and trash are removed in the Kapas.
Kapas	The seed cotton brought from the cotton fields.
Lakshmi Rieter	Coimbatore based collaboration /produces all textile machines
Lint	After removing the seeds from ginning we get the clean fluffy cotton termed as lint which is baled and sent to the textile mills for manufacturing yarn.
MMC	Machinery Manufactures' Association, Calcutta

Air-jet and Vortex Spinning Technology:

Both Air jet (AJS) and vortex (MVS) are based on air jet technology and produces fasciated type of yarn having out side binding fibres wrapped around as core of parallel fibres. Sliver is fed with very

high draft and passes through two nozzles before it is made into yarn. The major difference between the Air-jet spinning and Rotor spinning is that the former method is a false twist process and does not involve open-end technology.
MVS (Model 861) is based on the vortex air process, in which yarn from fibres circulating in the jet at the speed of sound are produced with real twist, by the take-up roller. This system is claimed to be suitable for 100% cotton fibres. Polyester blends can be spun successfully. The system is 20 times faster than ring spinning and 3 times faster than rotor spinning system. MVS yarns are superior in evenness with fewer thick places and lower hariness compared to of MJS. The yarn has compact structure softer and has fewer pills, even at the speed of 360-400 m/min. Murata, Toray of Japan are manufacturing MJS and AJS models. M/s Suessen of Germany is yet another company engaged in manufacturing Air jet spinning machines. More research and development is needed to make this technology universally acceptable.

Friction Spinning Technology: -

Here, the fibre strand is opened completely to the state of individual fibres and then reassembled into yarn. Spinning is carried out at a higher speed by means of friction and is based on aerodynamic mechanical means. The yarn formation is due to the twisting of fibre bundle between perforated spinning drums of bigger diameter, rotating in the same direction Each revolution of the drum imparts a large number of turns to the yarn. Thus, high twisting rate and production are possible. Special fibres like Aramid, Glass, and wastes, reclaimed fibres and as well as blends, natural man made fibres can be spun on this machine. The ability to spin bi/multicomponent heterogeneous yarn with distinct core and sheath arrangement from many types of natural and manmade when compared to the other methods of spinning. The major end use applications are Interlinings, Upholstery, Elestomeric Fabrics and Technical Textiles.

Ranking of fibre properties for different spinning systems: -

Fibre Property	Ring /Compact	Rotor	Air Jet/Vortex	Friction Spg.
Length,/Length uniformity	1	3	2	4
Strength	2	1	3	2
Fineness	3	2	1	3
Cleanliness	4	4	4	5
Inter fibre friction	5	5	5	1

Source: Points taken from " Newer spinning systems and fibre quality requirement." - S.K.Chattopadhyay and N.Shanmugum, CIRCOT, Mumbai, 2005

Indian cottons-

SUVIN, DCH.32, LAXMI, ANKUR.15, RCH.2, HYBRID 4, MCU.10, LRA.5166, PUSA 2-95, PUSA 31, PUSA 761, NHH.44, MECH.11, KASHINATH, DBH.105, SURABHI, LHH.144, BRAHMA, SHRUTHI, H.6, BUNNY, K.11

Mule Spinning	was the second machine produced during industrial revolution during 1850s. The yarns were very fine. Since it took lot of space, laborious to operate, only skilled people could operate the machine. The Ring Frame which arrived from USA was much superior and gradually replaced Mule Spinning by 1960.
NMM	National Machinery Manufacturers, Kalwa, Thane, Maharastra.
OE (Open End spinning)	This technology is in vogue from 1967. Although it produces 5 times more production and quality of the yarn is better, it has its own draw back for cotton spinning. It is also called Rotor Spinning, Break Spinning and Spindleless Spinning.
Platts	Leading machine manufacturers of Britain. They dominated the world for 170 years
Rieter	Leading machinery manufacturers of the world repute (Swiss)
Uster	World's leading testing instruments manufacturers
Weaving/Knitting	in both the methods we can make fabrics.

India is the cradle for cottons from time immemorial. The cotton technologies, like spinning, weaving, dyeing, printing etc were highly developed cottage industries that flourished during Mughals and Europeans. People involved in this unique textile culture were from Rann of Kutch to Koramandal coast and Dacca to Orissa, Pochampalli to Machlipattam.The conventional textiles like ikats, patola, brocades, kalamkaris, telia rumals and Dacca Mulmuls are some of the items attracted the European traders such as Portuguese, Dutch, English and French. After the industrial revolution, machines took over and the artisans of India could not meet the challenge. All this happened by the end of the 18th century. Textile machinery was imported by the mill owners in and around Bombay, and other parts of India. Indian cottons being very short and medium staple, they could not be worked on the machines. It was mainly used for very coarse fabrics. British mills at Manchester were also facing similar problems. American civil war and its aftermath caused severe shortage of raw material. Briton took a very bold decision to grow good quality cotton elsewhere, in Africa, India and the West Indies; Thus ICCC was commissioned in Mumbai, and the cotton breeding program was taken on top priority. Today ICAR is conducting the research work, and the results are promising. Cotton cultivation is undertaken in 8.8 million hectares. Although the productivity is 302 kg /ha which is far below the world average, it is sufficient to feed all Indian mills. Few million bales of long staple cottons are imported from USA, Australia, and some African countries. The Maharashtra Hybrid Co, in collaboration with Monsanto, USA, is the leading seed company. Others such as Rasi Seeds, Nath Agro, Nimbkar, and Indo American Seed Co. are helping the farmers with good seeds.

EPILOGUE

In a matter of twelve months since my retirement, I have witnessed tremendous developments in the activities of the institute. I attended the inauguration of "Referral Laboratory on Cotton Textiles at CIRCOT" in March 2005. The most significant and memorable day in the annals of CIRCOT' history was 16th July, 2005, when the institute bagged the most coveted award by ICAR. We were invited to share the joy of this proud moment befittingly celebrated on 20th August, 2005, at the Jubilee Hall, CIRCOT, by holding a workshop of contemporary relevance. The workshop entitled "Future outlook in quality assessment of textiles" by prominent speakers, who gave their expert views on the contemporary issues concerning the quality aspects of textiles and the importance of testing in the wake of WTO challenges. Dr.Nawab Ali, DDG, ICAR, Inaugurated the Workshop, by lighting the sacred lamp.

In the Technical Session-I, the theme being: "Quality requirements in Textiles." was chaired by Dr. Pitam Chandra, ADG (PE), ICAR, New Delhi. The main speakers being Dr. B.M.Khadi, Director, CICR, Nagpur, Sri. Suresh Kotak, Chairman, Messrs. Kotak Industries, Mumbai. Dr. S.K.Chattopadhyay presented the paper of Sri R.T.Iyengar, Rajapalayam Mills, (T.N)/ Sri. Shreyas Joshi, President, Raymonds Apparel Ltd; Mumbai, presented their papers in the morning. Sri Mahesh Sharma, Technical Adviser, Testtex India, and Textile Consultant, Mumbai, chaired the post lunch Session. The Theme being: "Quality assessment in Finished Textiles." The Speakers were, Sri. Ulhas Nimkar, CEO, Texanlab, Mumbai, Dr. Edward Menzes, Director, Rossari Biotech, Mumbai, Dr. P.S.Ramanathan, Director, Gharda Chemicals Ltd; Mumbai, highlighted the Eco-friendly products on Textile Processing- Benefits.

The mementos were distributed by the ADG Dr. Pitam Chandra. In the evening, there was cultural programmes by the employees of the Institute, where all the family members also took part. I consider that day as the Red letter day in the history of CIRCOT, and a proud day to rejoice with! Our institute earned the "Sardar Patel Outstanding ICAR Institute Award, for the best permanence in Agricultural Research Extension and Education." Rs. 5 lakh was granted to CIRCOT, for developing Technologies in the area of Textile Processing, By-products and Waste Utilization and transferring them to appropriate users groups. Sri. Sharad Pawar, Union Minister for Agriculture, Food and Civil Supplies, Consumer Affairs and Public Distribution, presented ICAR Awards- 2005 to various Agricultural Scientists, Institutes and Farmers on 16th July 2005, In New Delhi. Dr. Mangala Rai, D.G, was also present with senior officials, scientists and farmers. Dr. S. Srinivasan, Director, CIRCOT, Mumbai, received this most prestigious award from Sri. Sharad Pawar. Nearly 30% of the awards have gone to women Agricultural Scientists this year.

Details of the Awards.....

Total Number of Awards this year:	53
Total Number of Categories Selected:	12

The Awardees :

Institutes	AICRP	Scientists	Farmers	Journalists
1	1	46	4	1

The long journey of 8 decades is no doubt nostalgic, as one reads about the Technological Laboratory (Now CIRCOT). The track record is quite impressive. The work culture established by the former directors, and the focused and professional approach on the present day testing requirements by Dr. S. Srinivasan, eventually, culminated in earning the accolades for our Institute!

CIRCOT has been pioneering in the field of Micro spinning. The 5-decade-old micro spinning system conducted spinning trials on more than 80,000 samples. These include the breeding scientists samples under trial, blends trials of various kind, to be taken for research studies, the commercial samples belonging to private mills and institutions. The 81 year old Full spinning system is very useful test method for the same clientele.

It is gratifying to announce that some of the Miniature machines, Micro spinning and Doubling and Fancy twisting machines (in collaboration with TRYTEX Co; COIMBATORE), have completed the testing trials successfully, and available for sale. The details can be contacted with The Director, CIRCOT, Adenwala road, Matunga, Mumbai-400 019.

Miniature Micro Spinning / 2 for 1 Twisting/ Fancy Doubling Models developed by the Institute:

1	Laboratory Model fibre opener	All these machines are specially manufactured keeping in view of small size samples. The blends of cotton /Synthetics/ wool, and their blends can be processed effectively.
2	Carding machine	-Do-
3	Drawing frame –Sliver deposited in the can.	-Do-
4	4 Spindle Roving frame.	-Do-
5	12 Spindle Ring frame	-Do-
6	4 Rotor unit Open end spinning	-Do-
7	4 Spindle Two for One Twisting machine.	-Do-
8	12 Spindle Fancy Doubling machine	-Do-

Now, the total tests conducted amounts to 150; out of which NABL Accredited tests are 25. Circot has a list of 100-reputed clientele at the moment.

Textile testing facilities at CIRCOT :-

1	Cotton Seeds /Ginning	
2	Fibres	All the tests like, fibre length distribution, micronaire, maturity, strength, trash, nep, with the help of HVI and AFIS instruments.

3	Yarns	Yarn Count, Lea strength, CSP, Twist, Single thread strength, with Tenso rapid and Tenso jet, and Instron machines .Evenness parameters of Yarn, Drawing sliver, Rovings, evaluated through Uster Evenness Tester, and UT-4
4	Fabric tests	Fabric dimension, Ends and Picks, Type of Weave and Ply, Cover factor, Shrinkage in Fabrics, Tensile parameters, Water/air Permeability, Pilling, Tear strength, CRA, Flex abrasion, Bursting strength, Entire range of Fabric handle, Comfort properties employing KAWABATA FABRIC EVALUATION SYSTEM.

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	In the area of chemical, physiochemicaland Microbiological testing are :	Estimates of Wax and other additives, Scouring loss, Alkali solubility, Water soluble matter, Ash content, Polymer Viscosity Parameters, pH Evaluation, Water absorbency, Penetration, Wettability, Qualitative and Quantitative Estimation of Honey dew, Color evaluation of Dyed textile materials, through computerized color matching system, Evaluation of nature of dyes, all the color fastness tests, to various agents,. Evaluation of activity of Enzymes, employed in textile finishing, Identification and Quantification of different fibres in blended textiles,
	Evaluation of Flame Retardant properties as per different standards	

	Microbiological tests: -	Soil burial tests. Anti- mil dew tests.	Anti- fungal. Anti- bacterial evaluation.

	Ecological Parameters: - With the State –of –the –art- Equipments like,	HPLC, HPTLC, GC- MS, GC-ECD, NPD & FID, AAS with flame and Graphite Furnace, Hydride Generator, TOC Analyzer, TGA & DSC for thermal property evaluation. Employing the above equipment various Eco-Parameters like Carcinogenic dyes and red listed textile auxiliaries, Pentachlorophenol, banned pesticide residue, free and total Formaldehyde of finished fabric, harmful toxic elements etc; can be evaluated for issuance of compliance certificate for textiles meant for export.
	Cotton seed oil.	Free and total Gossypol content, protein content, evaluation of various quality parameters of cotton linters.

	Utilization of Agro- waste.	CIRCOT is recognized as the Nodal center for utilization of Agro waste and has done extensive work in this area. Modern machines are employed for physical testing and evaluating the agro waste of various types and are use in manufacturing hard boards, particle boards and paper.
	Fine structure of Textile fibres.	Sophisticated machines employed in the elucidation of fine structure of textile fibres such as Scanning Electron Microscope, State-of –the –Art X- ray Diffractometer, Instron Tensile Tester, X-ray Fluorescence Spectrometer.

Under the newly set up National Agricultural Technology Project, (NATP) World bank aided "Referral laboratory," CIRCOT procured 30 instruments out of which 21 are imported istruments and the rest are indigenous. The approximate cost is equal to Rs. 3.5 Crores.

The test procedures of the latest machines are being standardized. The Institute proposes to carry out tests on Electrical properties of yarns and fabrics, the use of functional and enzymatic finishing on fabrics apart from strengthening the existing tests on fibre/yarn/fabrics. AFIS, CONTACT ANGLE TENSIOMETER(SURFACE TENSIOMETER), X- RAY DIFFRACTOMETER, TEXTURE ARRANGEMENT, HARINESS & YARN FAULT ANALYZERS are some of the highly sophisticated instruments purchased under the scheme to measure physical characteristics of Fibres/yarns/fabrics.

FOURIER TRANSFORM INFRARED SPECTROPHOTOMETER, MICROWAVE DIGESTER, SPECTROFLUROMETER are some of the other major instruments procured to study the Chemical attributes of textiles.

An array of equipments to measure Water repellency, Laundering parameters and Flame retardancy of textiles are other facilities created under this special programme.

CIRCOT will initiate NABL Accreditation facilities for the expanded/newly-acquired facilities in the near future.

I refer to the following articles for details.

1.'Referral Laboratory on cotton textiles at circot – an insight into the additional facilities' – Dr. S. Srinivasan

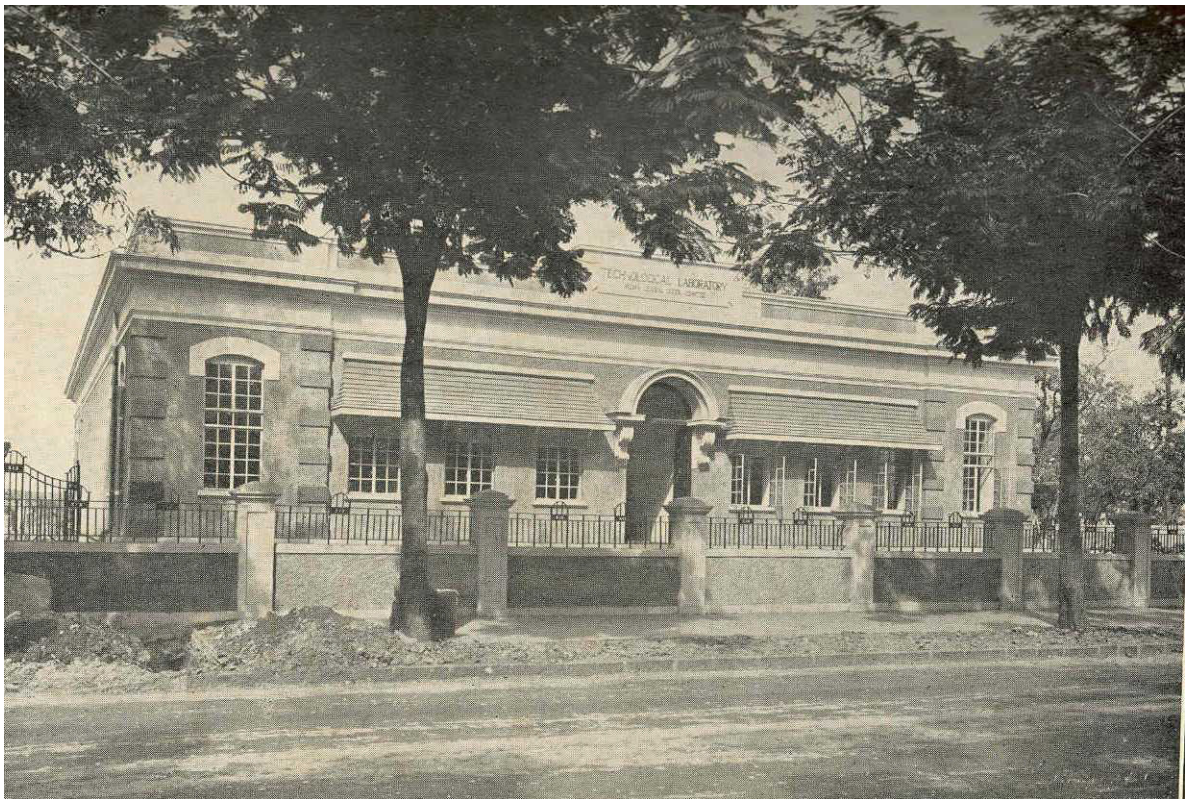
2.'CIRCOT as Referral Lab for cotton textiles' -Dr. G.F.S.Hussain, (Workshop on Future outlook in Quality assessment of textiles, August 20th 2005)

Finally, I conclude with grateful thanks to all who made this book possible.

H.R.Laxmivenkatesh 20th Sept 2005

Dr. Pitam Chandra, ADG (PE), ICAR, New Delhi, is presenting the Memento to *Sri. H.R. Laxmivenkatesh*

Ariel Photo of Circotians (2000).
From (R-L), . (9th, 10th, 11th) Dr. V.Sundaram, Dr. KRK Iyer, and Dr. S. Srinivasan (three successive Directors)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